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NITROGENOUS FERTILIZING AND ROTATIONAL GRAZING OF PASTURES.

EXPERIMENT IN PIAKO COUNTY, SEASON 1927–28.

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INTENSIVE GRASS-FARMING.

WITHIN the last two years many dairy-farmers in New Zealand have given their attention to the comprehensive work on grassland being carried out in Germany and England. Following the epoch-marking post-war experiments in Germany with soluble nitrogenous manures applied to grassland a widespread adoption of this method of forcing pasture throughout the year was forthcoming. The reports of results were generally astounding, the carrying-capacity of grassland being increased fourfold in some instances. This was due almost entirely to the great stimulation of grasses as distinct from clover.

A study of the experiments showed that an intensive system of pasturage had to be carried out to fully control the quick flush of grass induced by these soluble manures. Chemists by a wide series of analyses of pasture at different periods of its growth showed that grass when in the young succulent 4- or 5-in. stage was much richer in protein than grass at any later stage and that it ranked as a concentrated foodstuff. This, of course, had been generally known to agricultural scientists previously, and progressive and discerning dairy-farmers in this country knew from practical experience that short grass was the ideal for butterfat-production, while rank grass was left alone by milking-cows in an ordinary field. Here the cows had their choice and showed it for the shorter more succulent herbage, but if the animals were forced to consume rank grass they immediately dropped in milk-production.

Above all things the use of these highly soluble nitrogenous manures brought home the necessity for absolute control of grassland and the consumption of the grass in its immature state. This was only practicable by the subdivision of fields into such areas that a sufficient number of cattle could be brought to bear on the pasture to graze it down in one or two days when it was at the ideal stage of 4- or 5-in. high. It was shown that from eight to twelve cows per acre,

and even more, were required to do this effectively and quickly before the pasture became soiled. The number of fields had to be determined in order that a complete grazing rotational scheme might be inaugurated, so as to provide that each field would be grazed down when at the right stage. Dry cattle and sheep were utilized to clean up the fields after the dairy cattle had taken the "bloom" off the pasture. Such rank growth as then remained was mown off, and the field harrowed and closed until its next grass flush was ready.

There is no doubt that such control methods in grassland management are also capable of effecting a great increase in production per acre where only phosphatic fertilizers are used. It is not too much to state with regard to our dairying districts generally that the mismanagement of the grassland is our present stumbling-block. From November onwards the great majority of dairy lands are seen in varying stages of grass that has run to flower and seed-head. The loss in butterfat-production up till the end of December must be very great from this cause alone. Rectification must come by greater subdivision of these large fields into areas small enough to be properly controlled. To use soluble nitrogenous manures on large fields would not be practical, as proper control could not then be exercised—in fact, less control than before could be exercised. Subdivision and a proper water-supply are therefore more imperative with the new grassland manuring. Farmers must realize this point and use nitrogenous manures only on those fields that can be properly controlled. In this way knowledge of local conditions and the response from different fields under different climatic and seasonal conditions will be gauged, and such practical knowledge utilized to the best advantage in the future. The foundation on which a dairy-farmer must build is seen by every thoughtful man to be the adoption of the controlled paddock system. The farmers' aim will then be to manage his grazing in such a way that he can consume his grass at the 4- or 5-in. stage.

Compared with phosphatic fertilizers of proved worth, nitrogenous artificials purchased in New Zealand are very costly. The question of economy is therefore exercising the minds of thoughtful dairy-farmers. When it is considered that the use of phosphatic manures combined with effective tripod harrowing has produced such striking results this is only natural. At the present time 3 tons of superphosphate can be purchased as cheaply as 1 ton of sulphate of ammonia, the most widely known and used nitrogenous manure. The usual phosphatic dressing for grassland is 3 cwt. per acre per annum, but many farmers who have used double the quantity are convinced that the results are highly satisfactory. On most of the pumiceous Waikato and Thames Valley lands it would appear that the saturation-point for phosphates has not been reached with a 3 cwt. per annum dressing. On the other hand, the use of sulphate of ammonia and nitrate of soda has always been advised for the hay and ensilage crop. Such being the case, the returns from application of these manures should be greater when the grass is consumed at the 4- or 5-in. stage rather than as a mature crop of ensilage or hay.

Experiment at Manawaru, Piako County.

In order to study the effects on grass and the per-acre production of the two methods mentioned—namely, 3 cwt. of super plus several applications of sulphate of ammonia, compared with heavy applications of superphosphate—an experiment was devised and carried out last season on Mr. John Ward's farm, at Manawaru, Piako County. Selection of a farm which provided ideal conditions for such a trial was not easy, for it must be ideally laid out as regards its water-supply, number and size of fields, &c.

The sketch-plan of Mr. Ward's farm (Fig. 1, next page) shows the layout, &c., existing at the time the experiment was commenced. Relevant particulars are as follows: Area, 50 acres; number of fields, 8; number of cows, 27; butterfat till December, 1926, 4,111 lb.; butterfat till May, 1927, 8,043 lb. butterfat; per acre, 161 lb.

It will be seen that the farm is also a relatively high-production one. Of some thirty farms studied during 1926–27, the average production at Manawaru was only 122 lb. of butterfat per acre. The herd was composed entirely of big Friesian cattle, most of them pedigreed animals. The herd-testing association credited this herd with a production of 343 lb. butterfat per cow. The country is mainly reclaimed kahikatea swamp land, and hence fertile. The pasture is generally good, rye-grass predominating, with timothy, cocksfoot, crested dogstail, a little meadow foxtail, and white clover throughout. Weeds are not bad, but buttercup was general, with docks evident in the moister places. The farm had received 2½ cwt. superphosphate plus ½ cwt. 30-per-cent. potash salts, per acre, for the year, and in June, 1927, the whole area was top-dressed with 3 cwt. super per acre.

In view of the difficulty of obtaining correct production data from the various treatments during the early spring, when cows were calving daily and production was rapidly increasing, it was decided to make the first application of fertilizers just before the peak period of production. This was considered to be mid-November, and hence the manures were applied the first week in November. With the droughty conditions then obtaining this application was really a fortnight too late. Half the grazing area of the farm was top-dressed with 85 lb. of sulphate of ammonia, while the other half received 2½ cwt. of superphosphate per acre. Three fields were dressed with each treatment. The remaining two fields were closed to stock, one field for the hay crop, the other being spring-sown grass.

The grazing rotation decided upon commenced on 11th September. This was arranged so that the herd would be pastured for ten days on one half of the farm and ten days on the other half. Before the different fertilizers were applied each grazing-field was mown off, and the dry stock allowed to follow the herd and clean this up. There was very little top growth formed during this period, which showed that the grazing rotation had given excellent results. After the mowing of the fields buttercup came to flower quickly, but only crested dogstail and a little Yorkshire fog really seeded again to any extent. The white clover showed to advantage on the plain phosphated fields from Christmas onwards. The tripod and chain harrow also followed the mower, so that very even conditions were obtained over all the grazing-fields.

The full grazing period over the six fields was therefore twenty days. This period was arrived at after a study of the recovery period necessary to produce a 4- or 5-in. grass flush. It allowed three days' grazing on four fields and four days' grazing on two fields. With the

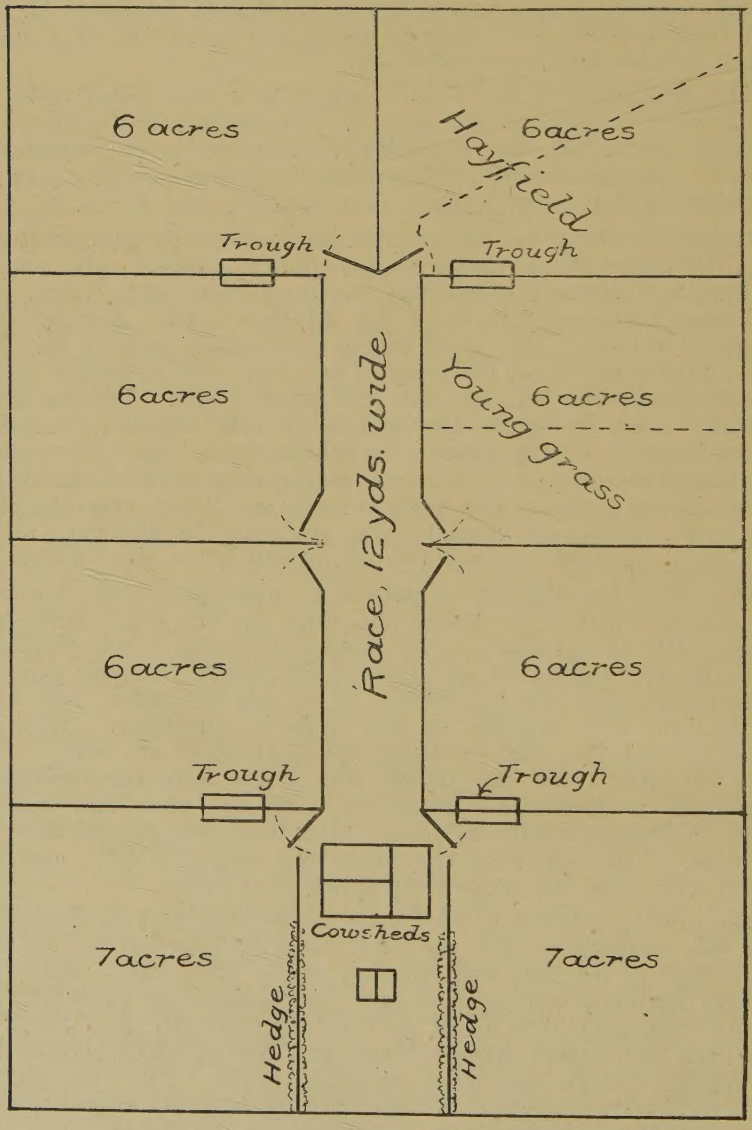

FIG. 1. SKETCH-PLAN OF MR. WARD'S 50-ACRE FARM, SHOWING SUBDIVISIONS, ETC.

The dotted lines in the areas marked " Hayfield " and " Young grass " indicate fences erected during season under review.

dry stock following the milkers, each field had six to eight days' grazing and fourteen days' spell in which to recover. During February the hay field and the young grass field were cut into two, giving a total of ten grazing-fields.

It must be stated here that there was an indication of a drop in milk-yield on the third and fourth days in the same field. Owing to the number of stock available for the size of the fields—namely, thirty-two cows and 6- to 7-acre fields—the stocking-capacity was only five to six cows per acre. With this light stocking three to four days' grazing was necessary on each field to get the full consumption of the best of the pasture. The rotation practised gave each field a spell of fourteen days between grazings. This length of time appeared about ideal during the spring and early summer. The grazing for the present season will be arranged to give a similar spell, or longer, as the case may be, to all fields to produce this 4- to 5-in. flush. The experience gained throughout the year has pointed to a maximum of two days on each field as being sufficient. Most of the fields have therefore been divided into half to allow of this. Some forty-two cows will be milked this season, and as the fields will range from 3 to 3½ acres only this will give a stocking of thirteen to fourteen cows per acre. It is considered that this heavy stocking will be ample to consume the 4- to 5-in. flush in from one and a half to two days at most. As practised last season, the dry stock will follow the dairy cows, and each field will be harrowed and mown off when necessary.

In practice it will be found that a set grazing scheme cannot always be maintained. Fields differ considerably in their pasture content and period of recovery, so that the fundamental principle of grazing off each field when it has reached the right height of 4 to 5 in. must guide the farmer in each case. On even country where the pasture is predominantly rye-grass the growth is very even, and the grazing will approximate a set rotation. It must be remembered also that this trial deals with converted kahikatea swamp country and a rye-grass-dominant pasture, hence its period of recovery and evenness of growth in different fields are typical only of such conditions. On cocksfoot-dominant country such evenness may not be apparent, and doubtless the recovery period will be longer. Every farmer has therefore his own particular problem to solve, but so long as he follows the principle of consuming his grass at the 4- or 5-in. stage he is on the right lines.

Following the application of fertilizers in early November a burning effect on the grass foliage was noticeable. This was more apparent on the ammonia-treated fields, and doubtless the clover suffered more on these areas. This point is worthy of consideration, as in practice it may be found in droughty seasons that the November-December applications of ammonia may seriously affect the autumn clover growth. This point is being carefully studied, and some more definite information should soon be available. During the summer, with the dry conditions at their worst, all the fields suffered badly, but the ammonia-treated areas showed the effect more. Two weeks after the application of the sulphate of ammonia the vivifying effect was noticeable in the pastures, and this response was indicated to some extent in the butterfat returns. It must be remembered that conditions were

extremely unfavourable for an experiment such as here recorded. The conclusions arrived at are therefore only tentative, and concern more particularly an unusually dry season. The second application of manures, which was to have been made in early January, was held over until the autumn rains and applied during the first week in March. The autumn growth was remarkable, and the recovery in milk-production was soon followed by a quick drop, so that the butterfat returns did not show any increase in favour of any particular treatment during this period. From 9th February till 8th March 1 ton of linseed nuts was fed to the herd, each cow receiving a little over 1 lb. at each milking. The cost of the concentrate was £14.

POINTS FROM THE MANURING AND GRAZING EXPERIENCE.

Points of interest may be summarized as follows:—

(1) Sulphate of ammonia during the warmer part of the spring and early summer—hence the quickest-growing time of the year—will give a response in from two to three weeks after application to rye-grass pasture. The June-July applications will take longer to produce a 4- or 5-in. flush, and indications point to five or six weeks.

(2) During the droughty season of 1927–28 the ammonia apparently gave a response lasting some six to eight weeks. This will doubtless vary under different conditions. Only 85 lb. of sulphate of ammonia per acre was applied at each dressing. Further research will determine what amount of this and other nitrogenous manures should be applied to grassland.

(3) If a field is allowed from twelve to fourteen days' spell to recover, the spring application of sulphate of ammonia should give three or four grazings, or perhaps more.

(4) A stocking of five to six cows per acre is not enough to control strongly growing rye-grass in two days' grazing. Indications are that some twelve to eighteen cows per acre are required to give control and consumption of the "bloom" of the pasture in this length of time.

(5) Three and four days' grazing on the one field is considered too much. Fouling of the pasture is apparently enough in this short time to depress the milk-yield. A maximum of two days should be aimed at during the flush months.

(6) Under drought conditions sulphate of ammonia may adversely affect the autumn clover-growth.

(7) If (6) is correct, spring applications of phosphate (and perhaps potash) appear necessary to strengthen the clover-production. This point is also being investigated at the present time.

(8) Given controlled fields supplying two days' grazing, at least eight fields are required in order to allow a full recovery period to produce a 4- or 5-in. grass flush. These eight fields would appear to be a minimum figure, and the safer number would be ten fields. For example, fifty cows would require ten grazing fields of $2\frac{1}{2}$ to 3 acres, or a total of 25 to 30 acres. These will supply the herd's requirements from mid-October to mid-December. The remainder of the farm should be closed for ensilage and hay.

(9) Where purely grassland farming is being practised, the herd's requirements should be at least 1 ton of ensilage per cow for the autumn

FIG. 2. PORTION OF MR. WARD'S FARM AND HERD (DRY STOCK).
The Manawaru cheese-factory is seen in distance.

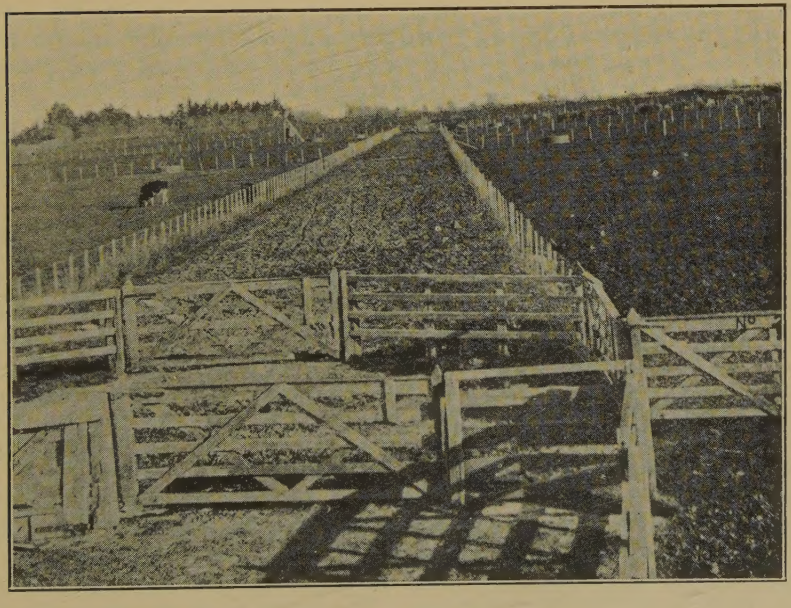

FIG. 3. SHOWING CENTRAL RACE ON THE FARM, TOGETHER WITH SUB-DIVISIONS, WATER-TROUGHS, ETC.
Photos taken in August.

months, 1½ tons of ensilage per cow for the winter and spring, and ½ ton of hay per cow for the latter period. The total of 2½ tons of ensilage per cow and ½ ton of hay can be harvested from ⅜ to ½ acre of intensively treated grassland. This is from one cut only, for it cannot be said to be wise to rely on two cuts of grass each year.

(10) Where a heavier stocking than the above is to be attempted, lucerne must play an important part in supplying the requirements of ensilage and hay. Where lucerne cannot be depended upon, annual crops that will occupy the land for a minimum of time and produce a heavy crop should be resorted to for amplifying the requirements of ensilage and hay.

INCREASE IN PRODUCTION FROM INTENSIVE MANAGEMENT.

Despite the unfavourable season, a very creditable increase in butterfat-production from Mr. Ward's herd was shown. The two seasons are compared in the following table:—

Season.	Acreage.	Number of Fields.	Number of Cows.	Butterfat till December.	Butterfat till May.	Butterfat per Acre.
				lb.	lb.	lb.
1926–27..	50	8	27	4,111	8,043	161
1927–28..	50	10	32	5,865	10,173	203½
Increase in 1927–28	..	2	5	1,754	2,130	42½

The graph on opposite page shows the butterfat production for the last three seasons.

The full benefit from the fertilizers was not obtained during the season of the experiment. Under such dry conditions as experienced, fertilizers are largely inactive. The increase in butterfat was largely due to the better control of the pastures and the consumption of the grass at the 4- or 5-in. stage. A succession of such flushes was obtained with little waste due to grass run to seed. During November most pastures are bolting to seed, and this coincides with the downward trend in production. The spring applications of nitrogenous fertilizers should be made some two or three weeks before the peak of production is reached. As this peak is usually the end of October, and as at this time the grasses are tending to come into seed-head, the applications should in most cases be made about the middle of October.

It is vital, of course, that control should be exercised at this period. If there is a general tendency for most fields to run to seed, either the mower must be used immediately or else one or two fields should be closed for a quick crop of ensilage. This should be cut as early as possible, in November for preference, so that the pasture is not "bled" to any extent and the aftermath comes away quickly and is ready in December. The mower should be set fairly low for trimming off excess growth of pasture. When it is set at 3 in. to 4 in. the grass tends to reseed quickly. October and November are therefore very vital months in grassland farming. The larger fields should be closed for ensilage, &c., thus ensuring the smaller fields for grazing. Better control can, of course, be exercised on these fields, as a heavier per-acre stocking can be brought to bear upon them.

In the experiment the total cost of manures used as extra to the standard 3 cwt. dressing of superphosphate amounted to £50. The extra amount of butterfat produced—2,130 lb.—was worth, at 1s. 6d. per pound, £159 15s. Actually the factory paid out 1s. 8d. per pound on cheesemaking.

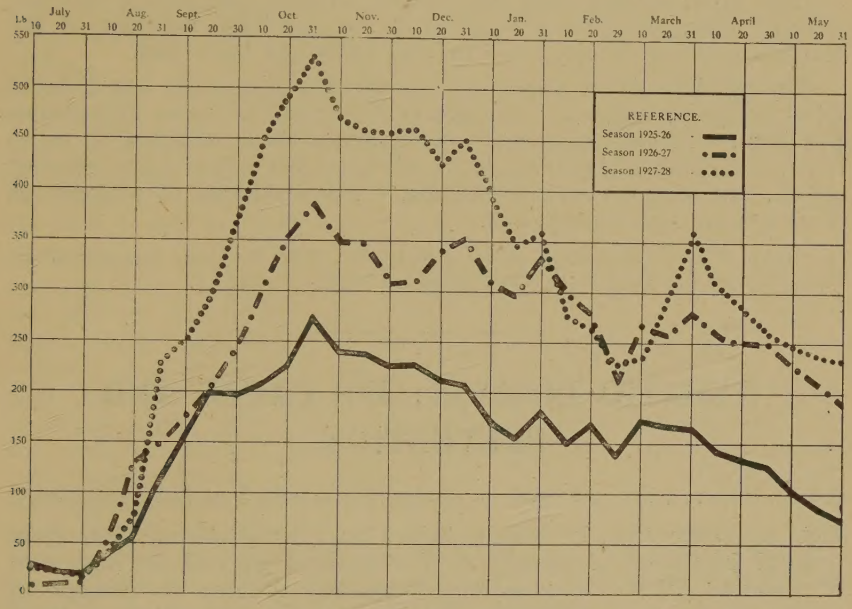

FIG. 4. GRAPH SHOWING BUTTERFAT PRODUCTION OF MR. WARD'S HERD FOR THREE SEASONS.

WINTER APPLICATION OF NITROGENOUS FERTILIZERS.

It is stated in the foregoing summarized points that observations indicate some six or eight weeks as necessary to produce a 4 in. or 5 in. flush of pasture during the winter months. Such a growth will be sufficient in those cases where a large proportion of the farm is being treated, and where there are plenty of fields for rotational grazing. In cases where only one or two fields are shut up to produce early spring feed, a flush of grass 6 in. to 8 in. long will be sought. Such a growth will give a feeding of ten days to two weeks or more, according to how it is fed off. It will take longer, of course, to produce such a growth, and the nitrogenous manures should be applied from mid-May to early June. Something like ten to twelve weeks' growth is necessary to produce this bulk of grass, and a farmer will top-dress according to his calving-dates. The growth should not exceed this, otherwise the tops will tend to yellow off, and the base also becomes matted and turns yellow. An efficient tripod and chain harrowing should follow the dairy herd in the spring.

GENERAL.

At the time of writing (November) Mr. Ward's farm is stocked with forty milking cows, six yearlings, two bulls, and two horses. Ten purely grazing fields each of 3 acres in extent are being used for the dairy herd; the remainder, 19 acres, is closed for ensilage and hay.

The writer acknowledges Mr. Ward's valued co-operation throughout the year, and the courtesy of Mr. G. Graham, manager of the Manawaru cheese factory, in supplying figures of milk-tests.

During the current season a large number of pasture top-dressing trials are being conducted throughout New Zealand, using nitrogenous fertilizers. In each case the experiment has been designed so as to obtain the number of grazing-days each treatment will give, its recovery period, and the per-acre production. Several kinds of nitrogenous fertilizers are also being tested.

NOTE.—Since the writing of this article, Mr. Wild has been transferred, as Instructor in Agriculture, to Invercargill.—EDITOR.

HYDATID DISEASE: ITS CAUSE AND PREVENTION.

C. S. M. HOPKIRK, B.V.Sc., Officer in Charge, Wallaceville Veterinary Laboratory.

THE mortality rate in human beings and the economic loss from hydatid infestation of animals in New Zealand are still too high, and it therefore behoves the dog-owners of this country to attempt to reduce the parasitic infestation if not to eradicate it entirely. With consistent efforts hydatids *could* in time be eradicated if every dog-owner carried out the necessary methods carefully and thoroughly.

WHAT HYDATIDS ARE.

Hydatids are cysts—hollow, thin-walled bags containing a fluid. There are several varieties, but only one affecting man. In this, *Echinococcus polymorphus*, there are minute heads called "seed-heads," or scolices, attached all over the inner wall of the cyst, and bathed by its fluid. Each hydatid cyst as it grows encounters resistance from the body of its host, and so nature usually produces a fibrous capsule round the cyst which helps to wall it off from the host. Nevertheless in some species of animal they grow excessively, man being the host in which most damage is done by the parasitic cyst. The usual habitation is in the liver or lungs, though occasionally other organs are invaded. As the cyst becomes older it may develop small cysts inside the larger (referred to as "daughter" cysts inside a "mother" cyst), or may develop branches of the one cavity from a slight rupture of the fibrous wall, allowing a hernia of the cyst to occur. This form is most common in sheep and cattle livers, while the daughter cyst is more common in man.

LIFE-HISTORY OF HYDATIDS.

The life-history is well known, and has several times been followed at Wallaceville for experimental purposes. When man is the host there is a tendency for the parasite to kill that host, but in the case of sheep, pigs, and cattle the host is rarely killed by hydatid disease—possibly because of the comparatively short life of a food animal. It is the livers and lungs of sheep or cattle that are dangerous, as regards dissemination of the disease, when fed to dogs without previous cooking. Then the raw hydatid cysts, after being swallowed by the dog, set free in the stomach of the animal all the seed-heads. Each one of these seed-heads now becomes a tapeworm, *Taenia echinococcus*, which by means of suckers and hooks attaches itself to the wall of the intestines and commences to grow. Small segments sprout off from the head, and altogether when adult the tapeworm has four or five. Its total length when well stretched out is rarely more than ½ in.

When the segments mature they are filled with fertile eggs, and the end segment as it ripens is able to detach itself from the parent tapeworm and pass out on to the ground in the fæces of the dog. Such segments appear within four weeks of the time the dogs eat the liver. The segment as it weathers on the ground breaks up and liberates many eggs—between one hundred and two hundred—which have already six small hooks inside ready for attaching themselves when they lose the shell and become larvæ. An herbivorous or omnivorous animal now swallows an egg, sheep and cattle picking them up in the pastures. The egg-shell is dissolved in the stomach of the new host, and the larva bores its way through the wall of the intestine, either into a blood-vessel or possibly directly into the liver or lungs. The liver is the main seat of invasion, but in many cases the lungs are also found infested Here the cysts grow, and the life-cycle is complete.

THE DISEASE IN MAN.

A number of surgical operations are performed annually in New Zealand because of this hydatid cyst which has grown from the egg of the tapeworm of the dog. It is considered that the parasite is usually picked up by young children, and that for many years—until the age of about twenty—there is but slow growth. Occasionally it is noted in early childhood, but usually the diagnosis is delayed, often until well on in life. For the first twenty years of the life of the host the cyst usually remains as a single bladder of varying size. After that time, however, it frequently develops daughter cysts, which in turn carry more seed-heads. By enlargement and pressure the cyst may burst, and so spread daughter cysts all over the abdominal or thoracic cavities.

In these days diagnosis is not difficult, and unfortunately a positive diagnosis means surgical interference in man, the operation being a serious one, more particularly where daughter cysts or adhesions of a large leaking cyst to the wall of the chest or abdomen have occurred, and there is a 10 to 20 per cent. mortality rate. In the laboratory museum at Wallaceville is a cyst taken from the lungs of a boy of three years of age. In this case the boy had caressed, as children do, a

sheepdog which was kept about the place for a month or two, and he contracted the parasite at the age of two. It does not seem usual for many of the parasites to gain a footing in any one human host, and usually no more than one cyst will grow, though possibly others are killed by the body before they are able to develop.

INFESTATION OF FARM-ANIMALS.

Sheep, pigs, and cattle—in that order—are the usual hosts, though horses, rabbits, deer, &c., may suffer to a slight extent. Only very rarely indeed does the infestation kill sheep and cattle. Cases have been seen where pigs have eaten fæces of dogs which were kept in the pigyard, and where the lungs and livers of the pigs were a mass of minute cysts, but such massive infestation is not usual.

PREVENTION OF THE DISEASE.

It must be clearly realized that human infestation cannot take place from eating the flesh of sheep, cattle, or pigs which have harboured hydatid cysts in their organs. It is the eggs produced in the dog or other animal which has swallowed the uncooked hydatid cyst, which when they gain entrance into the human subject, or into cattle, sheep, &c., are responsible for the production of hydatid cysts. As the disease causes loss of human life and is a source of economic loss to the country, it is necessary to prevent it.

At the present time in New Zealand very few town-dwellers become affected, the disease being one which affects country residents mainly. This is because of the system of meat-inspection in force, both for home consumption and for export. Town meat in the larger centres is all inspected by trained men at the abattoirs, and no affected livers or lungs are allowed to leave such abattoirs or freezing-works to be sold. Therefore town dogs must live on meat free from infestation by hydatid cysts, and are unable to get the opportunity of becoming infested with tapeworms. Consequently town children are comparatively safe. In the country, however, sheep are often killed for dog-food, or the dogs are given the raw livers from the sheep killed for human consumption and in which hydatid cysts may be present. In other cases dogs may be allowed to roam and tear to pieces a recently dead sheep. Is it any wonder that country children become victims?

The habits of the dog are most objectionable, as defæcation may take place in close proximity to vegetables of the salad class. Again, the dog in his efforts for cleanliness may frequently lick the hair about his hindquarters, and it is possible for the shed segment of the tapeworm to have become attached to the hair and thus be taken into the mouth of the dog, and later by caress passed on to a child, where it becomes a menace of extreme gravity. Also, in country districts the water-troughs or springs supplying the house are sometimes left open, and what more natural than that a dog should swim in this water and so liberate the segments to infect human beings or stock? This is not the dog's fault, but the negligence of the owner of the dog.

In order to prevent occurrence of the disease serious attention should be given to the following points: (1) Treat all country dogs medicinally at regular intervals; (2) do not give uncooked livers

or lungs to dogs; (3) train children not to caress animals; (4) do not allow dogs to eat unknown carcasses—these should always be buried; (5) keep drovers' dogs under control at abattoirs or meat-freezing works.

MEDICINAL TREATMENT OF DOGS.

In giving medicine to a dog it is advisable when possible to use a material which the dog will take easily and which is not too nauseating. Moreover, it is necessary to starve the dog by way of preparation for the proposed dose. Therefore the animal should be kept without food for twenty-four hours before administering the dose.

The best medicines for tapeworms are as follows:—

(1) Arecoline hydrobromide in a dose of $\frac{1}{8}$ to $\frac{1}{2}$ grain, depending on the size of the dog; a terrier $\frac{1}{8}$ grain; a big sheepdog $\frac{1}{2}$ grain; and a cocker spaniel, say, $\frac{1}{4}$ grain. The pellet or powder is dissolved in about a dessert-spoonful of water. Puppies of the more robust breeds withstand dosing with this drug well, but care must be taken with the toy breeds, which from the nature of their upbringing should not require dosing. This drug only expels and does not kill tapeworms; therefore care must be taken to see that the fæces expelled are rendered harmless.

(2) Liquid extract of male fern, in doses of 15 minims to 1 dram, depending on the size of the dog, following starving and purging. The dog should be prepared by giving a dose of castor-oil, and the day following the action of the drug the animal should be again purged in order to expel all the dead tapeworms. At Wallaceville an effective method was found to be that of purging the animal (the day after dosing with male fern) with $\frac{1}{8}$ to $\frac{1}{2}$ grain of arecoline hydrobromide dissolved in a dessert-spoonful of water.

(3) Areca nut is often used in doses of 10 grains to 1 dram. Areca nut contains arecoline as the active principle, and is not quite so reliable as the pure drug. Arecoline is usually 100 per cent. efficient, but areca nut is much less so.

There are other drugs which may be used, such as kamala, but, as mentioned before, arecoline hydrobromide is the only one that can be relied upon as thoroughly effective against tapeworms. One treatment should be sufficient, but a second a fortnight later would expel any further tapeworms which had entered about the time of dosing and had not been acted upon.

TEMPERATURE OF WAX FOR COATING CHEESE.

MR. J. Murray, Palmerston North, whose work in dairy technique is well known, informs the Director of the Dairy Division that after carefully conducted experiments he has found that a temperature round about 300° F. gives the best results for the paraffin-waxing of cheese. He states in the course of his communication: "When cheeses are immersed in wax at a temperature of 295° to 305° F., the wax becomes an integral part of the cheese, will offer greater resistance to rough handling, and the minimum amount of wax will be used. Cheese waxed at lower temperatures, although having apparently a satisfactory-looking finish, will show a rupture of the wax following pressure of the thumb into the rind. This is more noticeable at a waxing temperature of 240° F. or less, but improves as the temperature is raised."

PASTURE TOP-DRESSING BY MOTOR-LORRY.

DEMONSTRATION AT RUAKURA STATE FARM.

H. MUNRO, Manager, Ruakura Farm of Instruction, Hamilton.

A NEW system of applying artificial fertilizers to pasture which promises to prove effective and very expeditious—at least on level and easy undulating country—has been evolved by Mr. Ambrose Howell, of Rototuna, Waikato, and was recently demonstrated at Ruakura. Under this system a 1-ton motor-lorry is used for carrying the fertilizer as well as for mounting and driving the distributor. A star-feed distributor-box is suspended by iron brackets beneath the lorry, the front of the box being distant about 4 in. from the back wheels. The fertilizer is fed to the distributor through an opening in the floor of the truck. Power for working the distributor is provided by a chain drive working off a cog, which is permanently attached to the left back wheel of the lorry, as shown in Fig. 2.

Fig. 1 shows the original plant. Under this method the distributor, which was the box from an ordinary horse-drawn machine, was suspended behind the lorry, with a direct drive from an eight-tooth cog on the lorry-wheel to a twenty-tooth cog on the distributor. The minimum quantity of fertilizer that could be applied by this drive was 2 cwt. per acre.

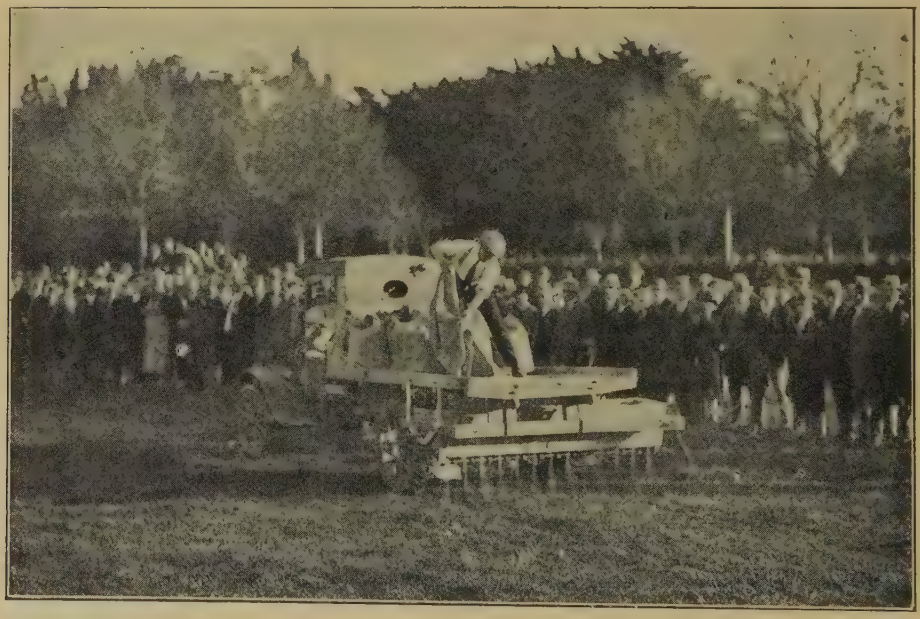

FIG. 1. DEMONSTRATION OF THE HOWELL FERTILIZER DISTRIBUTING SYSTEM (ORIGINAL ATTACHMENT) AT RUAKURA FARM OF INSTRUCTION.

On this occasion an 18-acre paddock was top dressed easily in 1½ hours, at rate of 2¼ cwt. per acre.

FIG. 2. THE LATER TYPE, WITH IMPROVED DISTRIBUTING EQUIPMENT.

In the improved plant (Fig. 2) as now in use a specially constructed distributor is suspended beneath the truck, and provided with a drive which gives a much greater range of distribution, permitting dressings of fertilizer ranging from 1 cwt. to 30 cwt. per acre.

The area that can be top-dressed in any given time depends largely on conditions, such as size of the field and contour of the country. On

level country with a good surface the maximum area that can be effectively treated is approximately 15 acres per hour, and at least 8 acres per hour can be treated on any country on which the plant can be safely used.

It might at first appear that the speed at which the lorry travels would cause the stars within the distributor to revolve so rapidly as to cause damage, but actually they do not revolve more rapidly than when horse-drawn, the larger cog wheel fitted to the driving-shaft of the distributor compensating for the greater speed.

THE PRODUCTION AND GRADING OF CREAM.

PRACTICE ON FARM AND AT DAIRY FACTORY.

W. DEMPSTER, Dairy Instructor, Hamilton.

COMPULSORY grading of cream in New Zealand has operated only since November, 1926, and probably no measure for improvement in the quality of our dairy-produce has established a uniform standard so quickly. This is largely due to the method adopted in the examination of applicants for cream-graders' certificates. The applicant can nearly be said to examine himself. A certain number of cans of varying qualities of cream are graded by the examining officer. The candidate is then asked to grade and classify the same material, after which the cans are changed, and he is asked to regrade them. If he agrees with himself on both rounds, although he may differ to a slight degree from the examining officer, it is a simple matter to teach the true value of flavour. On the other hand, if the candidate does not agree with himself on his second trial, it is shown at once that he is not capable of detecting the different flavours, and no amount of tuition would make him an efficient grader. The majority of graders have taken a keen interest in their work and have done the grading efficiently, realizing that their livelihood depends on the faithful interpretation of the regulations. It is very pleasing, when visiting a cream-grading platform, to see the keenness of the graders, as is shown when their attention is drawn to a flavour in cream with which they are not familiar. For the assurance of farmers who may think their grade has been lowered without cause, it may be stated that a doubtful cream is rarely lowered without the introduction of a second opinion.

While probably 95 per cent. of our dairy-farmers have accepted cream-grading and realized its advantages, there remain about 5 per cent. of dissentients, who can be divided into two classes. The first class claim that cream cannot be graded; the others say they know cream and are not getting their correct grade, the chief cause of complaint very often being that the neighbour is receiving a higher grade. The first class of supplier would stop the industry from progressing, as such a man is loath to attribute to others faculties which he himself does not possess. The senses of sight, smell, and taste may be quite defective when applied to cream-grading, much in the same way as

many people lack an ear for music. The man who says he has been among cows all his life and therefore knows milk and cream, really means that he knows milk and cream according to his own palate. He can invariably distinguish flavours, and thus provides a direct negative to the first class of dissentients. But while he can distinguish flavours he is not capable of giving them their true value, as probably he has not had the opportunity of making comparisons, and therefore does not know the butter-buyer's requirements. The butter-buyer is the man who must be pleased. The grading of cream, butter, and cheese is done with the object of giving him what suits the market.

The buying of butter is done on the senses of sight, smell, and taste. The grading of cream must also be done by the same senses. It is obvious that it would be a waste of time to apply a scientific test to a sample of cream which did not look, smell, and taste good. No farmer can therefore say that he would get a higher grade for such cream were a scientific test used. It can be taken for granted that some would get a lower grade, as a scientific test would show defects in cream in the course of development, defects which had not reached the stage where they could be detected by the senses.

GRADING OF CREAM IN RELATION TO THE GRADING OF BUTTER.

Controversy has sometimes arisen after the publication of dairy-factory balance-sheets to the effect that the percentages of the different grades of cream do not correspond with the different grades of butter at the grading-stores. Where a factory is well equipped and managed and is drawing its supply of cream from one class of country—either hilly or flat—and no butter is sold locally, the whole output being graded for export, it will be found that the grades of cream and butter correspond within a reasonable margin. On the other hand, where a factory is drawing its supply of cream from two classes of country—both flat and hilly—there may be a wide discrepancy in the percentages of grades of cream taken in relation to the grades of butter. In Auckland Province it is generally noticed that on flat, heavy country rye-grass, cocksfoot, white clover, and (in the north) paspalum are the main constituents of the pasture, and these grasses give a high-quality cream, which if pointed would score 94 points or over. But on adjacent hilly or undulating country, which until the advent of general top-dressing gave us our best cream, the pastures have been so changed that trefoil, Lotus major, subterranean clover, and cow-grass are now commonly dominant, and the quality of the cream (more especially in localities where there is much sweet vernal) will be on the border-line between "first" and "finest" grade.

It will readily be seen that the high-quality cream from the flat country when mixed will carry the border-line and a proportion of first-grade creams upwards, and will show a higher percentage of "finest" butter. Yet the grading of the cream would be consistent, as were the first-grade cream manufactured by themselves the result would not be finest butter. Where the greatest proportion of cream is first, and the finest is only on the border-line, the slightest error in manufacture would result in a proportion of the finest being carried downward; while, had the finest been churned by itself, the resultant butter would have been finest.

During the winter months this is very apparent, as, while there is a small percentage of finest cream, there is very little finest butter manufactured. As the supply of winter cream is increasing yearly, there should soon be a surplus of winter butter available for export; and in the writer's opinion the supply of winter cream to-day is not much inferior to the bulk of the summer supply ten or twelve years ago. As the great majority of farmers have responded in the past few years to the call for improved summer supply, so will they respond in respect to the winter season. Furthermore, as the winter supply of cream increases there will be more frequent deliveries.

HANDLING CREAM ON THE FARM.

The methods of handling cream at dairy factories in New Zealand compare more than favourably with those of other countries, but our weakness lies in handling milk and cream on the farm. It may be said that only about 15 per cent. of our farmers do everything that is known to be necessary to forward cream in as good a condition as is the milk when received from the cow, and which should result in a cream scoring 94 points or over. At the other end of the scale there may be about 10 per cent. who should not be handling cows at all, as these men, even when shown by a farm dairy instructor that it is possible for them to get a higher grade, soon drift back to their old methods.

There are some 65 per cent. of farmers delivering finest-grade cream around 93 points which can best be described as a borderline cream, while another 10 per cent. deliver a cream between 90 and 92 points. It is from this great bulk, which equals perhaps 75 per cent. of our output, that most of the improvement in the future may be expected. Probably 80 to 90 per cent. of this cream could be improved one point; furthermore, the farmers would be willing to effect such improvement if they only realized that it was possible and necessary. If we are going to hold our high position in the world markets this improvement must be effected. It is often noticeable on a farm from which finest grade—probably a 93-point—cream is being produced that one or two small things are neglected, and it is these small things which make the difference between a 93- and a 94-point cream or milk. One point in grade may seem insignificant to the individual, but taken on the aggregate of 90 per cent. of our farmers this one point would place our dairy-produce in an unassailable position. While this article refers primarily to cream, the foregoing paragraphs apply similarly to the production of milk for cheesemaking.

Where actual points for cream-grading have been given, the graders in many instances have awarded only 93 points as the maximum. The spirit of emulation has thus not been encouraged as much as it might have been, and much good could be done were points over 93 awarded to the deserving suppliers. The points awarded in connection with cream-grading are equivalent to the points which the resultant butter would score at the grading-stores if such cream were churned without mixing with other grades. Dairy companies should always send the supplier a docket informing him of the grade, or the grade and the points, awarded to each lot of cream received from him.

FARM DAIRY INSTRUCTION COMBINED WITH CREAM-GRADING.

While engendering the spirit of emulation may lead to appreciable inprovement in the quality of the cream, it is necessary that cream-grading and farm dairy instruction be carried on conjointly. The continuous receipt of low-grade scores, without any assistance or advice toward improvement, tends to a spirit of indifference and hostility. This, in many instances, would be removed by a visit from a farm dairy instructor. When farm dairy instruction was inaugurated and no cream-grading was done the results were disappointing, for until cream-grading was introduced the farmer did not realize the necessity for improvement, and was inclined to look upon the farm dairy instructor as an interloper. Since the introduction of cream-grading, however, the instructor receives a cordial welcome to practically every farm. Dairy-farmers generally recognize the value of instruction, and have ceased to think that low-grade cream comes only from farms other than their own.

Systematic visits are made to the farms by the instructors for the purpose of giving instruction in the best methods of handling milk and cream, the working of milking-machines and separators, the proper and quickest methods of keeping dairy premises and appliances clean, and generally carrying out in a most efficient manner the regular work connected with a dairy. The instruction given in the proper running of a separator almost in itself justified the employment of farm dairy instructors. Such instruction without cream-grading did not give the best results, nor can cream-grading exercise its full benefit without farm dairy instruction. Continual low grading of cream may spur some farmers to better efforts, but others may become disheartened or callous. Service such as the farm dairy instructor can give is helpful to both types.

CHANGES OF FEED AND PASTURES.

Since the inception of cream-grading it has been brought very prominently to the notice of farmers that a change in feed often brings a change in grade, for everything a cow eats must affect the quality of the cream. Even the best of grasses, legumes, or roots if fed exclusively for an extended period, will more or less affect the health of the cow, and in turn affect the quality of the cream. This is very noticeable in the spring, as during the winter months the cows are usually fed liberally on hay, with probably a dearth of roots or green feed. Such cows are more or less in a state of impaction, and when they are turned into paddocks which have been shut up in order to get an early growth, the change from practically a dry feed is so sudden that they commence scouring. Consequently the resultant milk and cream is so strong in flavour that it cannot be classed as finest.

As already indicated, rye-grass, cocksfoot, paspalum, timothy, and white clover produce the best-flavoured cream, the resultant butter being classed as the finest. Cow-grass, subterranean clover, trefoil, Lotus major, and lucerne produce a cream with a distinctive flavour, which cannot be classed as finest, for while the resultant butter may

bring as high a price as finest on special markets it could not be sold as finest on any or every market in the world. Mangolds, kale, chou moellier, rape, soft turnips, swedes, green oats, and barley, if fed in excess, often produce redwater in cows; and even in herds where the malady is not apparent so many of the cows are affected without showing acute symptoms that the cream is nearly always second grade.

How much this second-grade cream is due to feed, and how much to the health of the cow, is hard to determine. Probably 10 per cent. of swedes, 12 to 15 per cent. of soft turnips, rape, chou moellier or kale, and 20 per cent. of mangolds could be used as supplementary feed directly after milking without affecting the quality to any marked degree. The writer's attention was recently drawn to some cans of cream which were only passable as second grade. On visiting the farm it was found that the cause of the trouble was that the cows for two days had gorged themselves on partly cured mangolds to such an extent that many of them could not stand up. A cow has been known to eat 60 lb. of soft turnips in thirty minutes. When cows are turned into a turnip paddock twenty to twenty-five minutes is sufficient, as in that time they will get as much roots as is good for them and will dirty less. The important point when changing from winter to spring feeding is to make the change gradually, as much of the first-grade cream would be made finest could the cows in the spring be induced to eat hay after the grass becomes sweet and succulent. A certain amount of success has been achieved along this line by sprinkling the hay with molasses and water.

DEVELOPMENT OF FEED FLAVOURS THROUGH CONTAMINATION.

While it is pretty well recognized that feed flavours as such will not develop in butter, and can be described as characteristic flavours, feed flavours that arise through contamination are a different matter, as they are of bacterial origin and will develop in butter; consequently a dirty milking-machine can create feed flavour, which, had the milking-machine and utensils been clean, would not have lowered the grade of the resultant butter. Experiments have isolated the bacterium which causes turnip flavour independently of the purely feed flavour. This organism is also found in the manure of the cow, even after the manure is dry, and therefore explains what was previously a puzzle, as often a farmer's cream had turnip flavour at a season of the year when turnips were not available. It is evident that particles of dust containing the bacteria were sucked into the teat-cups when they were being placed in position on the cow's teats, and, becoming moistened with the milk, set up bacterial action and so developed the turnip-flavour. Furthermore, it is pointed out that manure from turnip-fed cows can smell so strongly in humid weather as to taint cream held in close proximity. There are therefore at least these two sources capable of developing turnip flavour when no turnips are being fed.

CLEAN SURROUNDINGS ESSENTIAL.

Many suppliers are going to a great deal of trouble to get finest-grade cream, but because of the lay-out of the shed it is almost impossible to do so, as the air around the shed and separator-room is not pure. Cream when leaving the separator is at just the right temperature to

take a taint, and if the atmosphere is impure the cream is certain to pick up whatever smell there is. The cream will smell just as does the separator-room or the place where the cream is kept. When in trouble the dairy-farmer might invite some one unaccustomed to milking to pay the dairy a visit. The visitor will probably detect a smell with which daily contact has made the owner familiar. One frequently hears complaints from farmers that their cream was graded low when not sour, sour cream being in their opinion the worst of all. But it is natural for cream to go sour; non-souring is a sure sign of inferiority. It is difficult to get two cans of cream exactly alike in flavour. So well versed do graders become that they can remember flavours as easily as they can remember the cans. The flavour is just as distinctly impressed on the grader's mind as if he had seen it.

POINTS IN THE PRODUCTION OF GOOD CREAM.

The following points are essential in practice if the farmer is to deliver a good product. If he is neglecting any of these essentials he cannot be said to be doing his best, and has no cause for complaint if his cream is graded other than finest.

(1) Every part of the milking-machine, vacuum-pipes, and tank, separator, &c., must be kept clean.

(2) The releaser-bucket and separator must not be in the engine-room. A passage between the separator and the engine-room is necessary.

(3) Milk should be separated and cream kept in a well-ventilated room, and the cream stirred often with a tinned metal plunger.

(4) The cream should be cooled with a water-cooler. Putting the cream in a tub of water is not sufficient.

(5) The surroundings of the separator-room and place where cream is kept should not be muddy.

(6) A plentiful supply of boiling water is necessary. *Hot* water should not be mistaken for *boiling*. Boiling water if carried from the house is useless for making the machine sterile.

There are many backblock settlers carrying out these essentials with good results, while often other farmers are complaining of the inability to produce a finest cream, giving as reasons the difficulties which have been overcome by others.

CAUSES OF SECOND-GRADE CREAM.

The following are some causes of second-grade cream, and in most cases they can be remedied by the famer.

(1) Badly arranged shed; (2) neglecting to cool cream; (3) mixing hot and cold cream together; (4) engine and separator being in same room; (5) failure to clean vacuum-pipes and vacuum-tank, and to leave vacuum-tank open when not in use; (6) dirty rubbers and milk-pipes; (7) putting rubbers in stagnant water; (8) lack of ventilation in separator-room; (9) muddy surroundings near separator-room; (10) not removing lids and not washing and scalding cans immediately on return from factory; (11) use of rusty cans and tinware; (12) using separator-room as storeroom; (13) use of carbolic disinfectants; (14) skimming too thin; (15) neglecting to scald tinware; (16) sour skim-milk barrels; (17) not washing the separator

after each use; (18) keeping cream too long on farm; (19) standing cans in sun awaiting conveyance; (20) using a cloth for a strainer, or using a cloth for washing instead of a brush; (21) using too small a separator; (22) using milk from unhealthy cows, or separating too soon after calving; (23) flushing out separator with hot water after separating; (24) using a teat-salve containing an odorous disinfectant; (25) pungent feed-flavours; (26) milking with soiled hands; (27) milking into unclean buckets.

BAD FLAVOURS AND THEIR CAUSES.

The following are a few flavours in cream easily recognizable, together with their causes:—

(1) Stale: This flavour is caused by keeping cream too long in an unsuitable place; neglecting to cool cream; mixing hot and cold cream together; skimming too thin and not stirring. A small quantity of this cream will flavour a whole vat, and it is always graded second grade.

(2) Maori bug: This is a smell like that which a Maori bug emits when disturbed or crushed. A little of this cream will flavour a whole vat. The flavour may be caused by the separator not being properly washed and scalded, yellowish slime forming on the tinware. Often a cloth more or less impregnated with the same slime is used for a strainer or in place of a scrubbing-brush. The flavour is accentuated by mixing hot and cold cream. Such cream should always be graded second, and in bad cases returned to the supplier.

(3) Fermented: One of the worst flavours. The cream is full of gas-holes, sometimes as large as a shilling. It often works like yeast and overflows the cans. Causes may be putting cream into cans which have previously held cream, and have not been properly cleansed and scalded; neglect to cool cream; mixing hot and cold cream; or keeping cream too long. Such cream is always second grade.

(4) Tallowy: The cream tastes and smells like tallow. The flavour is caused by washing the bowl of the separator with slime in it, then washing tinware in the same water and not scalding afterwards; putting cream into a warm can; or standing cream in sun; contamination from sheep-skins or harness, or various stores in dairy; washing the separator only once daily.

(5) Curdy or cheesy: This is a smell and taste resembling bad cheese. The causes are skimming too thick and not cooling; taking up taints from stores in the dairy, or oil and spilt milk on the separator-stand; bad ventilation; keeping cream too long without stirring.

(6) Sour: The cream tastes sour to a disagreeable extent. The causes are skimming too thin, and not cooling; keeping the cream too long on the farm in a warm atmosphere; the presence of skim-milk barrels in close proximity to where the cream is kept.

(7) Milking-machine: This flavour is caused through not cleaning rubbers, vacuum-pipes, tank, and releaser, or from perished rubbers; or it may be that the exhaust from the vacuum-pump is discharged

too near the milking-shed, so that the discharged air is redrawn into the system when the teat-cups are being put on the cows.

(8) Kerosene and benzine: Flavours caused by having the separator or releaser in the engine-room; kerosene or benzine stored in the dairy; smoky kerosene-lamps; exhaust from engine not being carried to leeward so as to avoid fumes being drawn into system when teat-cups are being placed in position on cows' teats; using benzine-tins as buckets; using roof-water for washing when exhaust is discharging through roof; using water out of the circulating tank for washing purposes.

(9) Carbolic: Flavour caused by using odorous disinfectants in shed, or odorous salve on cows' teats.

(10) Metallic: Flavour caused by cream taking up iron or copper after being put into cans or other tinware, such as milk-vat, separator, &c., with parts devoid of tin and perhaps rusty.

(11) Ropy: The cream lifts in strings. Caused by unhealthy cows, or cows drinking stagnant water.

(12) Rancid: Caused by chemical changes brought about through lack of cleanliness, and high temperatures.

(13) Cowy: Due to using milk too soon after calving; bad drainage in cow-shed; cows in ill health.

(14) Musty: Caused by cream being kept in a wooden building with no ventilation; decaying timber in separator-room.

(15) Slimy: Caused by using too small a separator. The bottom plates become dogged with slime, a certain amount passing into the cream. (Flushing out the bowl with hot water when finishing separating causes slime to pass into the cream; use skim-milk to flush bowl.)

(16) Cow-yard: Caused by muddy surroundings; manure-heaps; bad drainage; smells drawn in through teat-cups; leaving used overalls in dairy where cream is kept.

(17) Buttercup: Flavour prevalent in early spring, and is not unlike radish—sharp and pungent to the nose. Cream generally of high colour.

(18) Watercress: Cream with this flavour smells like acetic acid. More troublesome in the autumn.

(19) Pennyroyal: An easily detected flavour, smelling like the plant.

(20) Turnips, rape, kale, chou moellier: Strong undesirable feed flavours, always causing second grade.

Corticium Disease of Potatoes.—Experiments with corticium disease were carried through the season of 1927–28 by the mycological branch of the Fields Division, with the result that a considerable quantity of tubers free from this disease was secured. In plot experiments appreciable increases in yield were obtained over untreated potatoes. Dry dust treatments on the control of this disease proved under field conditions to be useless, even the best of the treatments having a high percentage of viable sclerotia present when the tubers were lifted.

LUCERNE-GROWING IN MID-CANTERBURY.

SOME EXPERIENCES AT ASHBURTON EXPERIMENTAL FARM.

J. G. McKay, Farm Manager.

Lucerne-growing is still more or less in the trial stage in Mid-Canterbury, and any marked increase in the area devoted to its growth within the past five or six years has been confined chiefly to the better lands where mixed farming is the practice. So far as the writer can gather, this increase does not exceed a matter of from three hundred to four hundred acres altogether. Demonstration plots at the Ashburton Experimental Farm have furnished useful information which has been available to and much appreciated by intending growers, and it is thought that a brief account of some results and experiences will be of interest.

INFLUENCE OF LUCERNE-GROWING ON CARRYING-CAPACITY.

It may be said that lucerne is no exception to the general rule governing pasture, in that its productiveness is governed by seasonal conditions and the class of land on which it is grown. Without irrigation or good summer rains it does not altogether solve the autumn feed-shortage problem in this district, as its growth at this period in average seasons is comparatively light. Nevertheless, while not entirely obviating the necessity of growing rape or other green feed for autumn, it is capable of carrying more stock and providing earlier spring feed than anything else of a permanent nature here.

During the seasons 1926–27 and 1927–28 the carrying-capacity of lucerne was tested against a similar area of young perennial rye-grass and red and white clover pasture, figures being taken from September to January in each season. The lucerne showed a carrying-capacity equivalent to 3·98 sheep per acre per annum for the period, against 2·93 for grass pasture. The land was of a similar nature in each case, varying from good to medium loam with shingle outcrops. The grazing method was identical in each case, stocking being intermittent throughout the growing-period, with both areas unstocked during the winter. Practically half of the lucerne area used in the trial has been grazed during spring and summer every season since its establishment in 1921.

It may be stated that winter grazing of lucerne has never been practised at Ashburton. If growth is fed down in March the stands are practically dormant during winter, and no good purpose is served by stocking at that stage. The best stands on this farm have shown a carrying-capacity equivalent to 3·2 sheep per acre per annum, with sufficient lucerne hay to bring the figure up to 6·7 sheep if supplemented by winter grazing in grass paddocks, which do not necessarily require to be good pasture-land, but light holding country for feeding-out purposes. Such country may safely be stocked at the rate of ten ewes per acre; and, although our experience in this respect is confined to actual winter months only, there is no evidence that it could not be continued for a longer period without ill effect upon the health of the stock.

A ration of 2½ lb. of lucerne chaff per head per day, with supplementary grazing as described, has been found sufficient to winter breeding-ewes well. A first draft of lambs, representing approximately 45 per cent. of the mob, from ewes wintered in 1924 in this way and depastured thereafter on green lucerne, realized the record price at that time of 46s. per head when three months old. Indications, however, are that as a finisher for forward stores lucerne is slower than good rape.

During 1923 a mob of 300 forward store lambs on account of Messrs. Dailey and Manchester was drafted into two lots of 150 each and topped off on lucerne and rape respectively. Although actual figures are not available, the writer was informed by Mr. Dailey that the number of second-grades was much higher among lambs fattened on lucerne than among those on rape. Though this trial may not be considered sufficiently searching to warrant its being taken as definite under all conditions, the writer is of the opinion that at least for the season mentioned it was quite reliable. There was an evident bloom or finish on rape-fed lambs which was lacking among those on lucerne.

Until the present season—during which two sheep on the farm have so far died from scour—deaths among sheep grazed on lucerne have never been attributed to this cause. Although somewhat laxative when the growth is very young, and short, it soon hardens up if sunshine prevails. In certain seasons, notably in 1925, when rye-grass and clover pasture was rather badly affected with rust, and ewes and lambs grazing thereon were scouring more or less, it was noticed that when moved on to green lucerne scouring ceased immediately. However, the death-rate from other causes, principally blowing or bloat, has always been higher on lucerne than on pasture, and for the seasons 1925–26–27 deaths directly attributable to this cause represent quite 3 per cent. of the sheep grazed. Although the majority of such deaths have occurred following heavy dews overnight or during showery weather, quite a number have been recorded under extremely dry conditions with north-west winds blowing day and night.

RATE OF SOWING.

In sowing certain areas in the seasons from 1917 to 1921 provision was made to compare various rates of sowing, 2½ lb., 5 lb., 18 lb., 15 lb., and 16 lb. per acre being tried. The respective distances apart in the rows were 7 in., 14 in., and 21 in.

If judged by the amount of hay produced, the rate of sowing, within certain limits, appears not to be important. 5 lb. per acre in 21-in. rows will produce as much as will 15 lb.; or 8 lb. in 7-in. rows as much as 16 lb. While 2½ lb. per acre in 7-in. rows is manifestly too thin a seeding, the same rate in 21-in. rows has under dry conditions produced as much as a 15-lb. seeding. This would appear to indicate that there is no gain in seeding up to 15 lb. per acre, even in 7-in. rows. However, even if comparatively thick seedings ultimately mean a survival of the fittest (and no doubt they do), there is plenty of evidence that light seedings encourage the early incoming of grasses to the detriment of the stand.

WIDTH OF ROW.

Except perhaps on hard-pan, where plenty of room for lateral root-growth is necessary, the 21-in. row method of growing lucerne is

not advocated. The chief objections to such a spacing are its unsuitability for haying, the encouragement of grass and weed growth between the rows, and the fact that when grazed in spring and summer, following winter cultivation, dingy wool invariably results, through the introduction of dust and dirt in dry windy weather. Probably its chief virtue from a grazing viewpoint is that, with the extra walking-room provided, stocking may be delayed during early spring until the lucerne hardens up.

The 14-in. row system, while having this grazing advantage to some extent, presents similar difficulties for haying, the crop usually requiring to be cut with the rows, and not round about, as may be done with 7-in. rows or broadcast lucerne.

Average yields of hay over a number of years favour the narrow spacing, showing a distinct drop when the 21-in. rows are reached. Instances are on record of an increase of 2 tons in green weight per acre in favour of 7-in. over 21-in. rows. On lands of free subsoil the 7 in. row is for general purposes undoubtedly the best.

PREPARATION OF SUITABLE SEED-BED.

The importance of a well-consolidated seed-bed cannot be overstressed, especially where the seed is being drilled in. Cases have come under notice here where a seeding of 2½ lb. per acre in 21-in. rows has produced as many plants per yard as a seeding of 15 lb., due entirely to overdeep sowing in the latter case. Investigation has shown that numbers of poor strikes and subsequent thin stands have resulted through sowing the seed too deeply. While the drilling method is advocated for local conditions in preference to broadcasting, owing to the fact that more even strikes are assured if the seed-bed has been properly prepared, it is realized that difficulty is sometimes experienced in getting the top-soil sufficiently consolidated under dry conditions to ensure shallow seeding.

If after the seed-bed has been prepared it is found to be too dry and loose the following method has been found excellent: Roll and leave the ground until rain falls. Allow sufficient time for annual weeds to germinate, then harrow, and when the surface mulch is sufficiently dry to ensure its falling in behind the coulters when drilling is done roll again, and sow, using blunt grain (or preferably turnip) coulters for the work. If the weather has been favourable and these operations rightly timed, sowing to a depth of from ½ in. to 1 in. is quite feasible without suspending the coulters in any way, and with sufficient dry tilth to cover the seed without resort to harrow or roller. The fact is that the object is defeated if either of these implements is used, as anything up to an extra inch of covering may then result. The roller has nothing whatever to recommend it at this stage. It consolidates the top-soil and detrimentally affects early seedling growth.

MANURING, LIMING, AND INOCULATION.

It has been recorded that in establishing certain stands, where lime and super were tested against lime alone, superphosphate gave a 75 per cent. increase in the first year, and even in the third season after

establishment a 7 per cent. increase in its favour was recorded. Thereafter the lime plots were equally good. However, the increase due to the addition of super over the three seasons, and the absence of weed-growth due to the extra cover thus afforded in the first season, leave no doubt as to the value of this fertilizer in establishing lucerne. It is quite evident that lateral root-growth due to its application at time of sowing is purely temporary, and that tap-root growth is not retarded to any appreciable extent by its use. Plants taken from a stand eighteen months old, on one of the best areas of the farm, where super at 2 cwt. per acre had been applied at time of sowing, were quite free from lateral growth, and the taproots were in some cases 5 ft. in length.

The effect on growth and colour from applications of inoculated soil prior to sowing has always been most marked. In the course of establishment stands receiving applications of 3 cwt. per acre without super have produced as much in green weight during their first season as those receiving 2 cwt. super without inoculated soil. An attempt was made in 1917 to establish lucerne on the farm without lime, manure, or inoculated soil, and the result can be regarded as a failure. A similar attempt with lucerne in 21-in. rows was made in 1919, and this stand merely existed until lime and inoculated soil were applied some eighteen months later. Quite good stands have been established where the land has received an application of lime alone, but the quickest returns have been obtained by using lime, manure, and inoculated soil prior to or at time of sowing.

GRAZING AND ITS EFFECT UPON THE STAND.

It would be idle to state that lucerne stands used exclusively for grazing are not detrimentally affected thereby, however careful the management. However, the degree of damage is not greater than one would expect, and in most cases is quite in proportion to the amount of grazing done. Although apparently unaffected for the first three or four seasons, grazed areas have then shown a falling-off in carrying-capacity. Spring growth is slower, and the incoming of grasses and weed grasses is noticeable. Weed grasses, such as barley-grass, goose-grass, and hair-grass, are seldom eaten by stock when better feed is available, and they run to seed in autumn and spread rapidly. Stands hayed in summer and grazed in autumn make more rapid growth in spring, and, generally speaking, are almost entirely free from grasses.

If judged on the wide-row system there seems little in the contention that lucerne should not be grazed until thoroughly established. The damage to stands grazed from their first season onward is apparently no greater than where the practice has been to hay for two and three seasons and then graze. It may be, however, that with the extra root-room and air-space provided the young plant is better able to sustain itself than if sown in narrow rows or broadcast. It has certainly been observed that lucerne in 21-in. rows comes away quicker after cutting and grazing than in 7-in. or 14-in. rows.

Old lucerne stands sown in 1917, although now becoming infested with Poa pratensis, are still producing too much feed to warrant ploughing up. These stands have been used almost entirely for grazing

during the past six seasons. Apart from their value for haying and grazing, they have successfully demonstrated the effectiveness of lucerne in smothering Californian thistle. The land was rather badly infested with the thistles when sown, but none have been observed since the lucerne became established.

TOP-DRESSING.

The response of lucerne to fertilizers used as a top-dressing has always been more marked on narrow than on wide rows, particularly on comparatively young stands. With the extra feeding-ground provided by the wide spacing, the plant at this stage is probably capable of producing something near its maximum without top-dressing. The lasting effect of super as a top-dressing for lucerne is evidenced by the following results. A stand sown in 1921 in 7 in. rows was top-dressed for the first time in 1924. The weights given below represent one cut in each season.

Season 1924.	Green Weight per Acre. Tons.	Increase over Control. Tons.
Control (no manure)	2·98	..
Lime, 840 lb. per acre	3·59	0·61
Super, 2 cwt. per acre	4·15	1·52
Lime, 420 lb., and super, 2 cwt., per acre	4·00	1·20

Season 1925.	Hay Weight per Acre. Tons.	Increase over Control. Tons.
Control	2·19	..
Lime	2·56	0·37
Super	2·52	0·33
Lime and super	2·67	0·48

Season 1926.	Green Weight per Acre. Tons.	Increase over Control. Tons.
Control	4·6	..
Lime	5·6	1·0
Super	7·2	2·6
Lime and super	7·6	3·0

Season 1927.	Green Weight per Acre. Tons.	Increase over Control. Tons.
Control	5·0	..
Lime	5·7	0·7
Super	6·4	1·4
Lime and super	6·3	1·3

As the aftermath in each season has shown marked growth in favour of fertilizers the actual increase can scarcely be estimated. All plots were cultivated and harrowed immediately following the application of lime and super in 1924, and have received similar cultural treatment in each successive winter, which fact makes the lasting effect of the super rather remarkable. It will be noticed that its greatest increase over the control is recorded in the third season after application. The land where the trial was conducted had received 1 ton of burnt lime per acre previous to sowing in 1921.

WINTER FEEDING OF HAY OR CHAFF.

Lucerne hay or chaff is relished by sheep of all breeds and ages. Half-bred station ewes that have never seen hay are no exception, and take to it readily. Although not considered a completely balanced stock-food, good lucerne hay evidently possesses some quality which aids digestion and makes it a valuable winter fodder for sheep, even if feed alone. Where the stocking is heavy during the feeding-out period and the breeding-ewes are relying entirely on hand-feeding, they should be driven about frequently during the last month of pregnancy, otherwise protrusion of the vagina will result through lack of exercise. If left to themselves they soon cultivate the habit of lying about waiting for the ration of hay or chaff to be brought along. When given sufficient exercise, the death-rate among the sheep at this farm from any cause which could be attributed to the exclusive feeding of lucerne hay or chaff has been nil over a period of three seasons.

HAYING.

Where the haying-implements comprise mower and automatic horse-rake only, the following method of saving medium hay crops has been found economical, and the hay produced quite good: When mowed, rake into light windrows as soon as the hay will leave the rake cleanly, the length of time between cutting and raking depending on the time of year, weight of crop, &c. First cuts require a proportionately longer period before raking, owing to the moist condition of the land and the sappiness of growth at that time. From windrows rake into small cocks or coils of from one to two fork-loads, using the horse-rake in the following manner: Take only half of the amount required for the cock in the first trip along the windrow. When the end is reached turn and rake the opposite way, travelling on the same track till the half cock is reached and giving it a half-turn in the operation. This makes a clean job and does away with trimming and topping, an operation which often involves a waste of time where high winds prevail. If rain falls before the stuff is fit to stack (as it so often does when the farmer has hay on the ground) the cocks should be left undisturbed for a day or two, when, if the weather has been favourable in the interval, most of the moisture will have settled to the bottom. When turned, a few hours should finish the drying with a minimum loss of leaf and resulting in hay of quite good colour.

International Seed-testing.—"Under the uniform system of testing and reporting proposed by the International Seed-testing Association," states the annual report of the Fields Division for 1927–28, "New Zealand, as a member, will be required to make a considerable number of special analyses on export lines. This will necessitate our strict adherence to the European system of testing, and it will therefore be necessary to make provision in staffing and equipment in the near future. These international certificates will be recognized in any country, and will be directly comparable with analyses made therein. This will result in the removal of many of the difficulties encountered in the export trade at the present time."

FARM-KILLED MUTTON AND PORK.

GUIDANCE FOR HYGIENIC EXAMINATION OF CARCASSES.

J. E. McIlwaine, M.R.C.V.S., Live-stock Division, Wellington.

It occasionally happens when a sheep or pig is killed on the farm for human consumption that some abnormal feature is met with on dressing the carcass. The following notes are intended as a guide for the farmer on such occasions.

Before an animal is killed it is well to note whether it appears to be in normal health in every way. An animal should not be killed for food if affected with severe diarrhœa or showing any symptoms of fever. It is advisable to have the selected animal fasted for twelve hours before being killed. The superior quality of much farm-killed mutton is in great measure due to the fact that the animals are not subjected beforehand to fatigue through travelling.

An apparently healthy animal having been selected and fasted, the slaughter is carried out, particular attention being paid to the fact that thorough bleeding is essential for the appearance and keeping-qualities of the meat. The internal organs should be removed as soon as possible after skinning is completed. This will prevent staining or discoloration of the carcass, which sometimes occurs when the entrails are left in position too long. There is also less danger of contamination with bacteria from the contents of the stomach and intestines.

Speaking generally, sheep in New Zealand are remarkably free from disease (and especially any disease likely to be transmitted to the human subject through consumption of their flesh). At the same time there are certain conditions which render the flesh objectionable and unfit for food. During dressing it is well to note the presence of any adhesions in the body-cavities. If such are associated with abscess formation it is advisable to reject the carcass. The seat of castration is sometimes subject to abscess formation, and this requires complete removal.

While thus examining the abdomen the presence of hydatid cysts in the liver or on the walls of the abdomen may be noted, and it sometimes happens that these cysts are seen in large numbers. The characteristic cyst is a thin sac or envelope containing a watery fluid. If ruptured and its lining examined with a magnifying-glass a whitish area will disclose the head or heads of future tapeworms. Any organs containing such cysts must be destroyed; in fact, if the cysts are very numerous it is advisable to destroy the entire carcass. Here it must be strongly stressed that such rejected organs must not be given to the dogs on the farm without thorough cooking, as such a procedure directly infests the dogs with tapeworms. The infested dogs as a result will again contaminate the pastures, and cattle, sheep, or pigs grazing on such pastures will be later found the subjects of hydatids. These cysts often become degenerated through age. Then they show a cheesy appearance, are yellowish-white in colour, and of firm consistency. Organs containing such cysts should be condemned.

In the chest-cavity of the carcass the presence of hydatid cysts in the lungs may again be noted, and if any are present the lungs must

be effectively destroyed. The lungs normally are free and easily removed, and if any adhesion is seen between the lungs and chest-wall pleurisy has been the cause. As in the case of adhesions in the abdominal cavity, if only localized and no abscesses present the carcass is fit for use.

A disease of sheep known as caseous lymphadenitis, characterized by the presence of abscess formation in the lymphatic glands, requires to be looked for. These glands are more commonly spoken of as "kernels," and those most commonly affected in this disease are situated in front of the shoulder-blade in the fore limb, and in the hind limb those situated below and in front of the stifle-joint, when the carcass is hanging up. Occasionally such abscesses are deep-seated and only seen when the carcass is cut up, and sometimes abscesses due to this disease are seen in the lungs and liver. If one or two glands are affected, only the quarter concerned should be destroyed: if several are affected throughout the carcass it should be rejected entirely. The pus in such abscesses has a characteristic greenish colour.

In connection with pigs slaughtered on the farm for home use the remarks made regarding hydatids and adhesions in the chest and abdominal cavities apply as stated in the case of sheep. Abscess formation in pigs at the seat of castration is more commonly seen than in sheep, as are abscesses in the abdomen. A condition sometimes seen in pigs which have been fed extensively on whey is that of gas-formation in the membrane supporting the intestines; this condition does not affect the carcass, but is mentioned as it might be mistaken for something more serious.

In the case of the pig, however, there is one disease which requires particular attention when examining a carcass, and that is tuberculosis. As the lymphatic glands or kernels are the most common seats of this disease, particular attention must be paid to them, and as many as possible examined by cutting into them with a knife. As there is a greater tendency in the pig for the disease to spread, this point is most important. The viscera of the pig can be examined as they are removed from the body. A chain of these small glands is situated in the membrane immediately above the intestine itself, and, although only the size of a pea or a bean, their position when diseased will be easily recognized. Another small group of these glands is situated on the liver where the large vessels enter this organ. A third group is situated on each side of the backbone after evisceration. When the animal is affected with tuberculosis these glands are enlarged, and contain a whitish gritty material. At times they may also contain pus when the disease is active.

When the lungs and heart have been removed the glands of the lungs should then be examined. These are situated on each side of the windpipe where it enters the lungs. The lungs themselves may be affected, and can be examined by the hands for any hard centres, after which they may be cut into with a knife. In advanced stages the disease may be present on the lining-walls of either the chest or abdomen or both. The disease is here recognized by the presence of small whitish nodules the size of millet-seed or a pea.

The head now remains to be examined, and in this connection it must be mentioned that the glands here are more commonly affected

with tuberculosis than any of the others in the body. Although a number of glands are situated in the head region, only two will be mentioned here, and these are situated one on each side of the lower jaw to the inside of the bone in front of the angle of the jaw. If the glands of the head only are affected and the rest of the carcass is healthy, the head should be destroyed, and the carcass can be used.

In the inspection of carcasses for tuberculosis it may be laid down that when the internal organs are only slightly affected the carcass can be safely used for food after destroying the affected organs. If, however, the disease is extensive throughout the internal organs, or if any part of the dressed carcass itself or the glands contained in it are affected, the entire carcass should be rejected.

UTILIZATION OF PIGS IN COMMERCIAL ORCHARDS.

A MARLBOROUGH EXPERIENCE.

M. DAVEY, Orchard Instructor, Wellington.

THE useful purposes served by pigs in orchards from early autumn until the advent of spring have been realized by individual orchardists in New Zealand for some years past, but it is questionable if the full value which can be achieved by such usage is fully appreciated by orchardists in general. It is for the purpose of making more generally known the good results which can be obtained that these notes have been written.

Owing to the visitation of a violent hailstorm in the early part of last summer several orchardists in the Rapaura district of Marlborough suffered great depreciation of their apple crops, with the result that an unusually large proportion had to be regarded as rejects from almost the commencement of the season. The line of action taken by many of the growers was that of picking only that portion of the crop unaffected, leaving in many instances 50 per cent. of the apples on the trees, with the problem of the ultimate disposal of large quantities of useless fruit to be considered. It was decided that the introduction of store pigs supplied the best solution of the difficulty. So far as the results of the disposal of this refuse fruit were concerned, the pigs served the purpose efficiently and well, but another service also was effected, which probably was of more value and of more far-reaching effect than the clearing up of the fruit—namely, the cleaning up of the orchards.

One instance in particular came under the notice of the writer, particulars of which are given as follow: The orchard, which is approximately 15 acres in area, was in a very neglected state owing to several changes of ownership and faulty management in the past. Heavy tufts of cocksfoot and couch grass were growing as high as the forks of the trees. The land had been repeatedly ploughed towards the trees, and finally left in unbroken furrows. This was the deplorable condition of the place in May, when forty-four pigs were introduced.

The mob consisted of forty-one weaners, weighing about 15 lb. to 20 lb. each, purchased at an average cost of 10s. In addition three breeding-sows in pig were included. Thirty-seven weaner pigs were withdrawn and sold in August at auction, realizing 24s. to 30s. each, while four weaners were retained until October and sold as porkers, realizing £2 apiece. These pigs received no supplementary food during the winter, deriving their entire food-supply from the refuse apples and vegetation growing in the orchard. The breeding-sows, which were in pig at the time of introduction, were withdrawn during August in first-class condition, for farrowing.

Apart from the substantial increase in value of the investment, the improved hygienic and cultural condition of the orchard with the return of spring is the feature which demands attention. All cocksfoot tufts had been rooted up and largely eaten, couch which had been undisturbed for years around the stems of the trees had likewise been rooted out and dragged by repeated turning over away from the trees and killed, while useless apples—hail-marked, black-spot-infected, and otherwise diseased fruit — had been thoroughly consumed. The undesirable heaping-up of the soil around trunks was entirely eliminated, which in itself would have represented a costly and laborious operation if carried out mechanically, and the cost of which in the past was regarded by the owner as prohibitive.

For the information of readers it may be stated that such good work could hardly be expected on heavy land; the orchard in question is situated on light river-silt. The consensus of opinion among commercial growers in this district is that where pigs are used to clear up fruit lying on the ground after harvesting it has a marked effect on the reduction of black-spot infection in the succeeding spring. This is probably due not only to the destruction of the infected fruit, but also to the increased aeration of the infected soil.

Although it may be convenient to allow reject fruit to remain unharvested, a note of warning may be opportune regarding the retention of useless fruit on the trees. It is very noticeable with the return of the blossom season that only light crops promise where fruit has been allowed to remain far into the winter on the trees. For three reasons this practice was fairly general in Marlborough last season—namely, lack of size owing to droughty conditions, hail injury, and the retention of some control over the quantities made available to the pigs. The prolonged sustenance of the fruit on the trees evidently has an adverse effect on the development of the fruit-buds for the succeeding season, and would appear to be a most undesirable and unprofitable procedure.

Another feature noticeable where pigs were utilized for clearing-up purposes in *well* cultivated orchards was a clearly defined ring around the trees only being rooted up. The reason for such a habit on the part of the animals is rather obscure, but possibly it may be found in the pigs' partiality for the grass-grub, which infests the light soils in this district. The grass-grub beetles during mating swarm on the terminal foliage of the trees, and after fertilization descend to the ground for the purpose of laying their eggs. The well-defined rooting covered the same radius from the centre of the tree as the terminal foliage. Whether the pupa of the grass-grub, under limited food-supply, feeds on the fine fibrous roots of our fruit-trees has yet to be proved.

BUTTERFAT FIGURES FROM HERD-TEST AND FACTORY RETURNS.

SOME CAUSES OF VARIATION.

R. A. WILSON, D.S.O., Marton.

WHEN statements are made about the annual butterfat returns of herds it is often left in doubt whether herd-testing or factory returns are referred to; or if factory returns are given it is seldom stated whether the factory is making butter or cheese. It was in order to get some idea of the differences that the writer kept the returns for two herds last season. One of the herds was tested under Group herd-testing, and the other under Official Herd-test. It will be seen that the figures of both systems show approximately the same discrepancy between the calculated and the actual factory return. In both cases the milk was separated and the cream supplied to a butter-factory.

Details are given in the following tables; the losses are calculated as being on the herd-test figures.

Herd No. 1: Group Herd-testing.

Month.	Number of Cows in Milk.	Butterfat in Test-sheets.	Butterfat in Factory Returns.	Excess of Factory.	Deficiency of Factory.	Percentage. (Approx.)
		lb.	lb.	lb.	lb.	
August	35	589	617	28	..	+ 5
September	52	1,970	1,317	..	653	—33
October	55	2,317	1,821	..	496	—21
November	60	2,432	2,068	..	364	—15
December	60	2,576	2,134	..	442	—17
January	60	2,354	2,124	..	230	—10
February	60	1,750	1,711	..	39	— 3
March	60	1,828	1,664	..	164	— 9
April	60	1,502	1,450	..	52	— 3
May	60	1,213	1,149	..	64	— 5
Total	60	18,531	16,055	28	2,504	..
Average per cow	..	308	267	..	..	—13%

Herd No. 2: Official Herd-test.

Month.	Number of Cows in Milk.	Butterfat in Test-sheets.	Butterfat in Factory Returns.	Excess of Factory.	Deficiency of Factory.	Percentage. (Approx.)
		lb.	lb.	lb.	lb.	
August	26	1,258	898	..	360	—29
September	34	1,506	1,382	..	124	— 8
October	45	2,374	1,954	..	420	—17
November	52	2,392	1,999	..	393	—16
December	61	2,508	2,129	..	379	—15
January	61	1,956	1,882	..	74	— 4
February	61	1,381	1,247	..	134	—10
March	61	1,212	1,208	..	4	..
April	61	797	704	..	93	—11
May	61	600	664	64	..	+10
Total	61	15,984	14,067	64	1,981	..
Average per cow	..	262	230	..	..	—12%

No comparison is intended between the two herds, as the circumstances were quite different. Herd No. 2 contained a large number of two-year-olds, and was much more affected by the dry season, as witness the quick falling-off in the autumn.

The results show a much greater discrepancy between test-sheets and factory figures than is generally realized. I therefore propose to give my investigation as to how far they can be accounted for.

Firstly, do the factory returns show the correct amount of fat, or is there an error here? Bulletin No. 109 of the Department of Agriculture, "The Overrun in Buttermaking," by G. M. Valentine, gives some figures to base an opinion on. He shows that with home-separated cream, with an average of 82·5 per cent. fat in the butter and with the loss in manufacturing calculated as 1·75 per cent., the overrun should be 19 per cent. Last year the factories in question showed an overrun of 22 per cent., so apparently they obtained more butterfat than they paid for. As the factories do not pay for fractions of a pound the gain is probably through this practice. It would seem that the gain is about 2 per cent. (The factories being co-operative concerns, the difference would, of course, be returned to the suppliers in another form.)

The variations between cow-testing and factory figures will now be examined. First comes the separator loss. Mr. Valentine shows in his pamphlet that skim-milk seldom contains below 0·07 per cent. of fat, which thus, with milk testing 4 per cent., amounts to 1·5 per cent. of the total fat. The average loss is probably about 2 per cent.

The most serious difference (one often not considered) is that for about six days after calving the milk contains too much colostrum to be used for separating for the factory and must be fed to pigs and calves, whereas the herd-test figures date from the day of calving. Six days is 20 per cent. of the first month, and as this is generally the heaviest month's production it is probably about 3·5 per cent. of the total annual production, assuming the cow's yield would be about six times her first month's production.

Then come the calves. Assuming that 25 per cent. of the calves are reared, and that they get 10 lb. of new milk a day for three weeks, and then taper off to skim-milk, and that the colostrum milk would represent the amount of new milk used in the tapering-off process, it would mean about 10 per cent. of one spring month's production, or, say, 1·5 per cent. of the annual yield. This, of course, is very approximate, as the circumstances vary so much. In my case I reared nearly 50 per cent. of the calves, so that probably more new milk was used. This was shown by the figures in the tables when the discrepancy becomes much smaller after December, when most of the calves were weaned.

Then comes the milk used by the household. Probably at least half the milk of one cow would be used, and if the herd was a fifty-cow one this would mean 1 per cent. With smaller herds it would be proportionately more.

Putting these items together we have the following: Shortage in calculation at factory, 2 per cent.; loss in separation, 2 per cent.; loss through colostrum, 3·5 per cent; fed to calves, 1·5 per cent.; house-milk, 1 per cent. This brings the total shortage loss out at 10 per

cent. The excess of the loss shown by my tabulated figures over this was probably due to more new milk being fed to calves.

With cheese factories the loss would undoubtedly be less, as probably there would be no calves to rear and no separator loss to allow for—but I have no figures in this connection. It would be interesting if some one could give corresponding figures for cheese-factory supply.

NOTE.—Certain other aspects of the subject dealt with by Major Wilson will be found in an article entitled "Herd-testing: Why Aggregate Association Records are higher than Factory Returns," by W. G. Batt, Farm Dairy Instructor, published in the *Journal* for June, 1923.—EDITOR.

STATISTICS AND THEIR RELATION TO AGRICULTURAL INTERESTS.

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THE collection of statistics dates back for thousands of years, the earliest on record (referred to by Herodotus) being a census about 3050 B.C. concerning the population and wealth of Egypt, required in arranging for the construction of the Pyramids. We thus see that the value of statistics was recognized in very early times. Such collections of data have occurred spasmodically throughout the centuries, when undertakings of unusual magnitude were being planned. It is only during the last fifty years, however, that statistics have been given full scope, and to-day there are few fields to which they are not applied. But many people are now asking, "Why this volume of statistics, and how much use are they when collected?" Such people can hardly realize how much depends on statistics. Few new laws or regulations are brought in without their use; in fact, progress in political and social reform depends largely on their collection.

There are many types of statistics collected, but they may be classified into two main groups—those of interest only and those of utility. We may discover from the collection of certain information a result which is interesting, but it may be impossible or unpolitic to apply it. For example, suppose that as the result of statistical investigation it was found that cows with naturally incurving horns were almost invariably high producers, but at the same time few cases of this occurred and that the characteristic was not hereditary; what value would there be in such a finding? Suppose also that men over forty years of age taking up farming for the first time were generally unsuccessful in their undertaking; would it not be unpolitic to introduce legislation to prevent them taking up farms? These are examples of "interest" statistics. But if incurving horns was a hereditary character we would know what cows to select for dairying and to breed from. Then the term "utility" statistics could be truly applied.

Uses for "interest" statistics may not be apparent at the time and may be discovered at later dates, or conditions may alter in such

manner that it would be politic to make use of them. However, the present aim of statistics is utility. It is the utility of statistics, and the extent to which they are made use of, which gives them their value. Statistics which possess far-reaching application may return in value to the community infinitely more than what may have been a costly collection. Cheap collection is not necessarily a saving.

FACTORS IN UTILITY STATISTICS.

Utility in statistics is obtained in five main ways—namely, (1) fundamental relation, (2) accuracy, (3) detail, (4) linking, and (5) applicability.

Fundamental Relation.—In planning a schedule or questionnaire care must be exercised in order that information requested shall apply to the fundamentals of the requirements of the collection. The closer answers relate to the problem under investigation the more valuable will be the resulting information. In order to achieve this, ambiguity must be entirely eliminated, so that no question may be misconstrued and consequently wrongly answered. Questions must be framed in such manner that they relate to the underlying causation of the phenomena to be studied. Naturally considerable knowledge of the subject is essential, and, moreover, foresight in considerable degree to provide for the possibilities of the investigation.

Accuracy.—Accuracy, as in the case of fundamental relation, depends on the successful elimination of ambiguity in questions. Questions, apart from being answerable in one way only, must be requested in understandable units—that is, units of every-day use. Moreover, the units in which answers are to be given should be definitely stated and, where necessary, carefully defined. Accuracy also depends on availability of information requested, and the manner in which the person approached treats the questions. All answers should be conscientiously supplied, and proper recognition of the value of statistics is necessary in order to achieve this co-operation. Detail is only valuable when it is correctly supplied. All carelessly compiled returns might as well be relegated to the waste-paper basket. Certainly small inaccuracies in detail are compensated for when large numbers of returns are available and resulting aggregates are essentially correct, but when such aggregates are submitted to close analysis subgroups often give ambiguous results. The law of compensating errors is a very useful one to statisticians, just as much as cumulative errors contribute largely to their worries. It cannot always be safely assumed that compensating rather than cumulative errors exist, and the best safeguard is accuracy in detail. The operation of the law of compensating errors must not be made the excuse for approximate returns where this is avoidable.

Detail.—Everything nowadays is becoming more and more scientific, and progress in science depends very largely on detail. Unless our statistics keep pace with this movement progress will be impeded. It is true to say that problems which may be investigated by a few simple questions are becoming rarer and rarer, those confronting us to-day not being possible of solution by rule-of-thumb methods as in the past.

That period is gone, and the new era calls for detail and more detail —in other words, scientific methods, for science is largely a study of detail.

Linking.—By "linking" is meant supplementation. One principal aim of all statistics should be the supplementing of one section by another. To ensure this quality all units of collection and presentation should be so designed that they possess interrelation properties. In this country, for example, a personal collection of data may be supplemented by a larger and more general collection by post, and these in turn by Dominion-wide statistics as compiled by the Government Statistician. The desirable feature of interrelation should exist not only between each collection, but also within each collection. Nothing does more for applicability of results than this provision of linking or supplementation.

Applicability.—Applicability of a result depends on how many uses it may have, and how far-reaching each use may be. The former is achieved by employing a general system of interrelating units—that is, linking; the latter by such measures as fundamental relation, accuracy, and detail. Applicability of results enhances the value of statistics immeasurably. The more uses to which a finding may be put, the more likely are results to be achieved. How far-reaching results may be is dependent on how vital are the findings applied. Use is the greatest value-contributor to statistics, and maximum use may only be assured by aiming for maximum applicability.

It is generally recognized that accurate detail is difficult to secure, but if accurate detail means success it certainly warrants more attention. People receiving questionnaires or schedules asking for information in considerable detail need not be unnecessarily perturbed at what is required of them. Far better that they be perturbed where accurate detail was not requested. Actually in the latter case it would be justified, but certainly not in the former. There is an old motto, "Nothing is worth achievement which does not involve hard work," and this is particularly true in the statistical field. To introduce more value into our statistics more work is required of the persons approached, and it is work which will be well repaid.

If the difficulty of securing necessary detail is permitted to render it expedient to adopt more or less general questions, the value of the resulting statistics will be lessened. If the person supplying information is to be "let off" furnishing this or that, the questionnaire or schedule may become so pruned down that it has little if any utility. Antagonism on the part of the person appealed to towards the collection of useful data is a decidedly short-sighted attitude. Antipathy results in half-measures, and this in turn in reduced utility and value.

TRADE INTERESTS INVOLVED.

The time has now arrived when all should recognize the great value of properly collected statistics. Better statistics mean more reliable information, and reliable information greater progress. Although the cost of collection and the time required of the person supplying returns may be greater, it will prove a real saving in the end. Such remarks as, "Why should I supply this information?" or "Think

of the valuable time I spend each year filling in statistical returns" only go to show that there are people who fail to see more than their requirements of the moment. Discard all our statistics, and imagine how we could possibly compete successfully with other countries in the world's markets. The largest financial interests do not see fit to operate without having previously made an exhaustive study of all available statistics that bear on their field of interest. A similar service to the one which commercial men utilize is also available to the primary producer if he realizes the possibilities and co-operates in achieving it.

STATISTICS AND THE FARM SURVEY.

Agriculture holds an important place in New Zealand's statistics, but hitherto little has been done outside the work of the Government Statistician. One of the most useful applications of statistics to agriculture is the so-called "farm survey." The Farm Economics branch of the Fields Division is engaged in making a number of farm surveys covering all branches of farming, and wishes to stress the importance of this work to the agricultural community. The particular aim of the work is to obtain information relative to the connection between management and production. One farmer's experience is limited, and it often takes a lifetime for him to sufficiently solve his problems to be able to properly cope with them. The farmer can ill afford to experiment, nor does he like to be continually changing his methods. The effect of this generally results in adherence to certain old-established methods which do not necessarily give the best returns. One method is not always the best method, since results vary according to the type of farm. Generally speaking, farm-management problems do not suitably lend themselves to investigation by experiment, and it is here that statistical survey comes to our aid. For such purposes it is quicker, less expensive, and has greater scope than experimentation. Statistical farm surveys make the farmer their experimentalist, in so far that all the variations required for investigation are met with among the many farms covered by the field of inquiry.

In conclusion, proper recognition of the value of collecting statistical information must again be stressed, especially in the case of farm surveys, to which it behoves all primary producers to give their whole-hearted support. Co-operation is the key to the success of the movement, and on each farmer's co-operation, as much as that of others, may depend whether the service which it is aimed to render is to result successfully or not.

Cream-grading.—In his annual report for 1927–28 the Director of the Dairy Division remarks: "The compulsory grading of cream, and the payment of a differential price for 'finest,' 'first,' and 'second' grade cream, has been in operation during the whole year, and the beneficial effect of this is reflected in the high quality of our creamery butter. It is pleasing to record that the great majority of dairy companies have been whole-hearted in their endeavour to grade in accordance with the standards fixed by the Division. Some irregularities, inseparable from the introduction of any new method, have come under notice, but these have been corrected, and with few exceptions the system is now working on comparatively good lines."

POTATO-MANURING EXPERIMENTS IN CANTERBURY, SEASON 1926-27.

(Concluded.)

A. W. Hudson, B.Agr., B.Sc., Crop Experimentalist, Fields Division.

In the season of 1926–27 experiments were again conducted on the farms of Mr. L. C. Banks, Coutts Island, and Messrs. W. and A. Campion, Prebbleton. A further trial was commenced on the farm of Mr. W. Smith, Willowbridge. The experiments on Mr. Banks's farm are here designated Nos. 3 and 4; those on Messrs. Campion's Nos. 5 and 6; and those on Mr. Smith's Nos. 7 and 8. The method of conducting the experiments was described in the *Journal* for July, 1926, page 12.

The treatments used in Experiments 3 (Banks) and 5 (Campion) were as follows:—

	Quantity per Acre.
(1) Super, 42–44 per cent. tricalcic phosphate	.. 3 cwt.
(2) Super, 42–44 per cent. tricalcic phosphate	.. 5 cwt.
(3) Super, 42–44 per cent. tricalcic phosphate	.. 7 cwt.
(4) Control (no manure).	

Each plot was three rows in width. Six replications of each treatment were sown in each case.

Experiment 3: L. C. Banks, Coutts Island.

Variety: Whites (mainly Northern Star). Date sown, 20th September, 1926. Date harvested, June, 1927. History of field: In grass for three years prior to experiment.

The crop was inspected on 17th November. All the manured plots were decidedly better grown than the controls, although the latter displayed a better colour. The 7 cwt. of super plots showed a decided superiority in growth over the 3 cwt. and 5 cwt. plots.

The results are set out in the following table:—

Table 3.—Experiment 3.

(The figures in each case represent the average of 18 plots each $\frac{1}{176}$ acre.)

Treatments.	Yield in Tons per Acre.				Profit as Result of Manure.
	Table.	Seed.	Small.	**Total.**	
					£ s. d.
No manure	6·05	2·53	3·49	12·07	..
Super, 3 cwt.	7·14	2·39	3·84	13·37	2 7 0
Super, 5 cwt.	7·47	2·71	3·77	13·95	2 19 0
Super, 7 cwt.	7·85	2·88	4·27	15·00	3 16 0

COMMENTS ON TABLE 3.

The method of valuing increases was described in the earlier part of this article under Table 1. The increase of just over 1 ton of table potatoes as a result of using 3 cwt. of super is highly significant, and shows a good profit. In this experiment the increased quantities of manure continue to furnish returns which are even more paying than with the smaller quantity.

Experiment 4: L. C. Banks, Coutts Island.

As in the preceding year on this farm, the manures used were :—

	Quantity per Acre.
(1) Super, 42–44 per cent. tricalcic phosphate	.. 3 cwt.
(2) Super, 3 cwt., plus sulphate of potash, 1 cwt.	.. 4 cwt.
(3) Super, 3 cwt., plus sulphate of ammonia, 1 cwt.	.. 4 cwt.
(4) Super, 3 cwt., plus sulphate of ammonia, 1 cwt., plus sulphate of potash, 1 cwt.	.. 5 cwt.

Another treatment, in which 1 cwt. of potash was top-dressed on a phosphate plot, was applied. This method of applying potash gave the same results as No. 2 above, and is therefore disregarded. In 1924–25 the application of potash as a top-dressing (see *Journal*, April, 1926, page 263) proved very beneficial, and the same method of treating with potash has been tried each season since. It has not proved of special benefit in either of the seasons subsequent to the first.

Details regarding date of sowing, &c., are the same as those for Experiment 3.

Observations during growing-period: On 17th November the plots receiving super and potash were not quite so well grown as those having super alone. All plots treated with the mixtures containing sulphate of ammonia were better in growth and colour than those having super alone.

The following table gives the results :—

Table 4.—Experiment 4.

(The yield figures in each case represent the average of 19 plots each $\frac{1}{176}$ acre.)

Treatments.	Yields in Tons per Acre.				Profit or Loss as Result of Manure.			
	Table.	Seed.	Small.	**Total.**		£	s.	d.
(1) Super, 3 cwt.	11·10	2·41	3·76	17·27	Profit	2	7	0
(2) Super, 3 cwt., plus sulphate of potash, 1 cwt.	10·88	2·30	3·91	17·09	„	1	9	0
(3) Super, 3 cwt., plus sulphate of ammonia, 1 cwt.	10·43	2·38	4·23	17·04	Loss	0	15	0
(4) Treatment (3), plus sulphate of potash, 1 cwt.	10·44	2·61	4·45	17·50	„	1	13	0

COMMENTS ON TABLE 4.

(1) The super is shown as bearing the same profit as that which it gave in Experiment 3 (Table 3). Potash has in no way affected the yield, and its use has considerably reduced the cash return.

(2) Super versus super and sulphate of ammonia: Although the difference between the *total* yields of these treatments is small and non-significant, there is a marked diminution in the yield of table potatoes and an increase in the yield of small, due to the sulphate of ammonia. The reduction in yield of the table grade is in marked contradistinction to the results of the two previous seasons. Whether soil or season has been responsible for the alteration is problematical.

Probably both factors contribute to some extent. In the season under review the sulphate of ammonia has been worse than useless on this farm.

(3) The addition of the potash to the phosphate and nitrogen combination has not improved the yield to a significant extent.

Experiment 5: W. and A. Campion, Prebbleton.

Variety: Dakota. Date sown, 14th October, 1926. Date harvested, 6th May, 1927. History of field: In grass five years prior to experiment.

Observations during growing-period: On 3rd December all superphosphate plots were markedly better in growth than the controls, the 7 cwt. quantity of super being the best of the manured plots. The appearance of the plots on 11th January can be seen in Fig. 5.

The results of the experiment are set out in Table 5.

Table 5.—Experiment 5.

(The yield figures in each case represent the average of 30 plots each $\frac{1}{165}$ acre.)

Treatments.	Yield in Tons per Acre.				Profit as Result of Manure.
	Table.	Seed.	Small.	Total.	
					£ s. d.
No manure	3·19	1·31	0·46	4·96	..
Super, 3 cwt.	4·05	1·59	0·56	6·20	2 2 0
Super, 5 cwt.	4·05	1·74	0·61	6·40	1 14 0
Super, 7 cwt.	4·18	1·72	0·62	6·52	1 11 0

FIG. 5. EXPERIMENTAL PLOTS ON MESSRS. CAMPION'S FARM DURING GROWING-PERIOD.

The three poor rows to right received no manure. To their left the plots are—super, 7 cwt., 5 cwt., and 3 cwt. respectively. In the preceding season an equally striking difference in appearance between super and no-manure occurred, but without any actual effect on the yield of table potatoes.

COMMENTS ON TABLE 5.

The 3 cwt. quantity of super has yielded a significant increase in each grade, with quite a good profit of £2 2s. per acre. The increased quantities of manure have further increased only the seed potatoes to a significant degree, and their use has reduced the profit.

Experiment 6: W. and A. Campion, Prebbleton.

In this experiment the manures used were as follows, six replications being applied:—

	Quantity per Acre.
(1) Super	3 cwt.
(2) Super, 3 cwt., plus sulphate of ammonia, 1 cwt	4 cwt.
(3) Super, 3 cwt., plus blood (approx. 12 per cent. nitrogen), 187 lb.	4 cwt. 75 lb.
(4) No. 2 mixture, plus sulphate of potash, 1 cwt.	5 cwt.

Prior to the experiment under review, blood at 1 cwt. per acre had been used as the nitrogenous manure on this farm, with not very good results (see *Journal*, February, 1927, page 103, and May, 1926, page 323). In view of the success attending the use of sulphate of ammonia at Coutts Island, it was considered advisable to try this at Prebbleton. As indicated above, 1 cwt. of the sulphate of ammonia was used, and the amount of blood increased to a quantity equal in nitrogen content to the sulphate of ammonia.

Details regarding date of sowing, &c., were as for Experiment 5.

Observations during growing-period: On 11th January, 1927, the superphosphate plots were slightly inferior in colour and growth to the remaining plots, which were very uniform in appearance.

Table 6 gives the results of weighing.

Table 6.—Experiment 6.

(The yield figures in each case represent the average of 30 plots each $\frac{1}{185}$ acre.)

Treatments.	Yeild in Tons per Acre.				Profit as a Result of using Manure.
	Table.	Seed.	Small.	**Total.**	
					£ s. d.
(1) Super, 3 cwt.	5·26	1·46	0·48	7·20	2 2 0
(2) Super, 3 cwt., plus sulphate of ammonia, 1 cwt.	5·28	1·60	0·50	7·38	1 4 0
(3) Super, 3 cwt., plus blood, 187 lb.	5·26	1·58	0·50	7·34	1 4 0
(4) No. 2 mixture, plus 1 cwt. sulphate of potash	5·43	1·60	0·49	7·52	0 16 0

COMMENTS ON TABLE 6.

As in Experiment 4, the superphosphate profit is shown to be the same as that which occurred in the previous experiment. The yields are strikingly similar in this experiment, and the only significant increases in yield due to the nitrogen and potash are those of the seed grade; nitrogen and potash were quite unprofitable in use.

Experiments 7 and 8: W. Smith, Willowbridge.

The field in which these experiments were conducted had been previously cropped as follows: 1925–26, barley; 1924–25, wheat; 1923–24, potatoes; 1922–23, grass.

Extremely wet conditions were experienced after sowing of the crop on 2nd November, 1926. Unfortunately, much of the area was drowned out, and the crop proved to be a very poor one, due to no factor other than the weather conditions. However, it was considered advisable to take an estimate of the total yields.

Experiment 7 was the same as Experiments 3 and 5. A very unusual feature of this experiment was the fact that although all manured plots were better in appearance than the controls, the 3 cwt. super plots were decidedly better than those having 5 cwt. and 7 cwt. The plots were weighed on 26th May. Ten weighings were made in each treatment, the area of the individual weighed plots being 1/188 acre. Only the increases over control are shown in Table 7.

Table 7.—Experiment 7.

Treatment.	Total Increase over Control.
Super, 3 cwt.	1·8 tons per acre.
Super, 5 cwt.	0·6 ,,
Super, 7 cwt.	0·8 ,,

The superiority of super, 3 cwt., over the 5 cwt. and 7 cwt. treatment is statistically significant.

The manures used in Experiment 8 were as for Experiment 4, except that no potash was top-dressed. The plots receiving potash were better than those having super by about ½ ton per acre, although none of the differences proved to be significant.

General Conclusions.

Superphosphate at 3 cwt. per acre continued to give highly paying returns, and from results of the past three seasons its use is highly recommended.

Sulphate of ammonia did not fulfil the promise it showed in the two previous seasons. The benefit indicated by the improved appearance in the growth and colour of the crop in every case in which it was used did not prove to be paying, except at Mr. McIntosh's farm, Kaiapoi (see Experiment 1).

Sulphate of potash in the season under review in no case caused an increase sufficient to warrant its application.

Thanks are due to Messrs. McIntosh, McLenaghen, Banks, Campion, and Smith for their whole-hearted co-operation in the experiments. The efforts of Fields Division officers who ably assisted in carrying out much of the field-work and compilation of results are also much appreciated.

LAUREL POISONING IN STOCK.

A CASE OF DEATHS AMONG CALVES.

D. A. GILL, M.R.C.V.S., D.V.S.M., and P. McGREGOR, M.R.C.V.S., Live-stock Division.

THAT the public in general, as well as those in charge of stock, should remember that laurel is poisonous is well exemplified by a recent case of which the following is a brief account.

In a certain township in Central Otago four weaner calves running out on the commonage died within twenty-four hours. The symptoms shown were sudden and acute. The beasts went down and lay struggling convulsively on the ground, frothing at the mouth and showing acute distress. After about ten minutes the convulsions ceased and the animals died quietly. In each of the four cases the illness only lasted—from the first signs till death occurred—about twenty minutes.

The last calf affected died in the evening, and a post-mortem examination was made next morning. The only abnormalities found were an inflamed condition of the fourth stomach and the small gut. The symptoms shown and the rapid death suggested that the calves had eaten some plant from which hydrocyanic acid (prussic acid) had been generated in the stomach. There are a number of plants and plant-products capable of this, and one of the commonest is the cherry-laurel (*Prunus laurocerasus*).

Inquiries were made, but apparently there was no laurel growing on the commonage or in the surrounding gardens, and it began to appear that this could not have been the cause. However, on making a thorough inspection several branches of the plant, some of which had obviously been partly eaten, were found in a piece of swamp by the roadside. Some time previously the local hall had been decorated in connection with a function held there, and a large amount of laurel had been brought in from the neighbourhood for the purpose. Later it was pitched out, and some children had dragged a large branch of it on to the commonage. Here much of it had withered, but that which had fallen into the swamp was still quite green and fresh.

All of this material that could be found was immediately collected and disposed of, and that the trouble with calves running on the commonage immediately ceased was sufficient confirmation of the diagnosis.

The leaves of cherry-laurel are poisonous to stock because in them is a substance called amygdalin and an enzyme (ferment), which under suitable conditions of heat and moisture interact to produce hydrocyanic or prussic acid. When the leaves are masticated and swallowed, conditions in the animal's stomach favour the rapid production of the poison, and death very quickly ensues. The inflammatory condition found present in the fourth stomach and small gut is not due to the hydrocyanic acid, but to an oily substance, something like turpentine, which is also present in these leaves.

WEEDS AND THEIR IDENTIFICATION.

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TUTSAN (*HYPERICUM ANDROSÆMUM* L.).

SOME of the weeds that have been illustrated from time to time in the *Journal* are included in one or other of the schedules of the Noxious Weeds Act. Such is the case with the one now shown—tutsan—which is on the Second Schedule of the 1928 Act (Third Schedule of the 1908 Act). Probably nearly all the scheduled weeds have been illustrated in New Zealand in the past, but there is very little uniformity in these illustrations, which are scattered through a number of different publications.

Apart from such things as the means used in making the original drawing and in reproducing it, there remains the factor of size, and as a rule very little attention is paid to this most important point. If one drawing is natural size and another half that scale, much of their value for purposes of comparison vanishes, no matter how clearly the degree of magnification is marked on each. It is thought that a complete series showing all the scheduled weeds without these disadvantages would be welcomed by many readers of the *Journal*.

It will probably be generally admitted that the most adequate way of showing the general appearance of a plant is a life-sized coloured illustration. In these articles the colour has to be described in words, but (except where certain details are shown which are almost invisible to the naked eye—for example, "*c*" in the present illustration) the drawings are natural size.

DESCRIPTION OF TUTSAN.

Tutsan is something like the better-known St. John's wort (*Hypericum perforatum*) in appearance, but it is much bigger, with larger leaves and fewer and far less showy flowers.

It is a shrubby plant forming a bush 3 ft. or 4 ft. high, with stems which are more or less green and soft at the tips but quite hard and woody at the base. The stems have several "wings" or narrow ridges running along them, giving them rather the look of being angular in section. The roots of tutsan are not creeping like those of St. John's wort, and tutsan is never found as an aggressive weed of grassland. The leaves are stalkless and more or less egg-shaped, or sometimes even heart-shaped, and are arranged in pairs on opposite sides of the stem, each pair being at right angles to those above and below it (see figure). Masses of tutsan can often be recognized at a distance from their bronze-coloured leaves though they are green enough when quite young. In autumn this colour may range through many different purples to blood-red, and is almost the most striking characteristic of the plant.

The general appearance of the flower—which is pale clear yellow in colour—is shown in the figure. The fruit is quite fleshy and berry-like, and cannot be confused with that of St. John's wort, which is hard and dry, and splits open when it is ripe. Three of these fruits may be seen in the figure, half-concealed by the leaves; below are

TUTSAN (HYPERICUM ANDROSÆMUM).

(*a*) Flowering and fruiting branch, natural size; (*b*) seeds, natural size; (*c*) seeds magnified.

[Drawing by E. H. Atkinson.

shown the seeds, natural size and magnified. The berries are decidedly attractive to birds, which play an important part in spreading the plant.

POSITION AS A WEED.

Tutsan, which is a native of Europe, West Asia, and North Africa, has been naturalized for very many years in New Zealand, where it has a wide distribution in both Islands wherever the situation is cool and damp. It may often be seen in great luxuriance lining the edges of small streams, and in many places (for example, the hilly country round Wellington) is certainly one of the most characteristic plants along the outskirts of forest that is gradually disappearing before changing conditions. Tutsan has a long flowering season, and scattered flowers may be seen at most times of the year, which is a fact worth remembering in connection with control, in view of the possibilities of it being spread by birds from odd berries. For control purposes the weed should be grubbed up and burnt wherever it is found.

FARMING OF BUSH-SICK COUNTRY.

SOME FURTHER RECOMMENDATIONS.

B. C. ASTON, F.N.Z.Inst., Chief Chemist, Department of Agriculture.

THE proper handling of "bush-sick" lands and treatment of affected ruminant stock is a matter of such importance as to warrant some recapitulation of information previously published in the *Journal*, together with amended and additional points suggested by later experience.

The use of double citrate of iron and ammonium in the prevention and cure of the iron-hunger which constitutes "bush sickness," has been so successful at the Mamaku Demonstration Farm that increasing numbers of settlers on the sandy silt and coarser pumice lands have taken advantage of this Department's offer to supply the drug to *bona fide* farmers at cost price—2s. 6d. per pound—through the Stock Inspectors at Rotorua and Tauranga. Evidence has accumulated that favourable results are being experienced by those who are using the drug and following instructions. It is important that careful attention should be given to these instructions, and they are here repeated for general information.

The dose for a cattle beast is 2 fluid ounces of a 6-per-cent. solution twice daily; for sheep one-fourth of cattle-beast dose. For younger animals the dose should be proportionately reduced, but the dose for a cattle beast should be not less than 1 oz. 1 lb. of the crystals may be dissolved in 13½ pints of water to make the necessary solution. The medicine is most effective for cattle when given as a drench.*

*Field work to discover the best method of treating sheep and lambs is at present being carried out by Mr. C. M. Wright, Country Analyst. The pellet method of the Rowett Research Institute, Aberdeen, gives promise of being successful. In this the prepared pellets, mixed with pieces of turnip, are placed in a trough. The sheep soon learn to eat the prepared pellets (a mixture of meals and mineral salts).

Some farmers have mistaken the directions to dissolve the drug in water and give 2 oz. of the solution, and have given 2 oz. of the solid scales. This is a serious mistake, and is likely to have injurious rather than beneficial results on the stock so treated.

It is convenient here to summarize the Department's recommendations for coping with iron-hunger in stock and farming lands of the volcanic "soil-province" classified as sandy silts and gravelly sands of Rotorua County. The soil maps of the county published in the *Journal* for June, 1926, and August, 1927, may be usefully referred to in this connection.

(1) Farm more highly; harrow pastures freely; get the plough in; compact the soil (with a roller where possible); grow plenty of winter feed; and save plenty of good hay free from mould. Subdivide into smaller paddocks, and keep the pastures eaten short. Top-dress with phosphate—preferably containing iron or in conjunction with iron sulphate; a good programme is 2½ cwt. superphosphate mixed with ½ cwt. iron sulphate in autumn or spring, and ½ cwt. iron sulphate alone or with super in the following spring or autumn. Treat the stock well, especially in the matter of water-supply.

(2) Use molasses freely in the feeding, especially in rearing young stock. Regard molasses as a preventive, but not as a cure.

(3) When an animal shows signs of going back in condition owing to iron-hunger, give iron-ammonium citrate. Keep on with the treatment till the animals are healthy.

(4) Buy any stock required from districts remote from the affected pumice land, and under conditions which ensure that the animals are free from disease or parasitic infection. Lack of the mineral elements is known to predispose an animal to other diseases and ailments, which, when introduced on to a farm on sick country, run a rapid course among the stock.

(5) When rearing calves provide iron in the skim-milk, after giving them a good start with whole milk, and if possible follow with some good calf-food in the skim-milk. One fluid ounce of citrate solution should be put in each feed once a day for each calf.

(6) Put rock salt in paddocks in weatherproof places so that it will be available for stock.

The need for increasing the organic matter or "humus" content of pumice sandy lands cannot be too strongly insisted upon. Theory indicates that could green-manuring (ploughing-in green crops such as lupins) be introduced as a constant item of farm practice it would probably improve the nutritive quality of the herbage, and perhaps transform "bush-sick" lands into healthy country. The practical difficulties, however, have hitherto proved so great that it has not yet been possible even to demonstrate the truth of this theory.

Water for Butter-washing.—The improvement of water for washing butter in the process of manufacture is engaging the attention of several dairy-factory managers in North Auckland. The Bay of Islands Co-operative Dairy Company has installed a filter, and other concerns are considering the adoption of this method or treatment of the water by pasteurization.

SEASONAL NOTES.

THE FARM.

CROP-PRODUCTION.

In most places the sowing of swedes may be successfully extended into January, but if the weather conditions are very dry or sowing is delayed past the middle of the month it is usually more profitable to sow soft turnips than swedes. Imperial Green Globe is a suitable turnip for January sowing. Care should be taken that excessive quantities of soluble fertilizers are not sown with the seed, or the germination may be erratic. A mixture of super and rock phosphate, super and slag, or super and lime is generally more satisfactory than straight super.

In Southland and South Otago such crops as chou moellier, thousand-headed kale, and cabbage are generally sown before the middle of January. Chou moellier is of great value as a winter forage, as it stands frost well, has a robust habit of growth, and grows well in club-root-infected soil.

Italian rye-grass sown in January or February is an excellent crop for autumn, winter, and spring feeding. The use of this crop could well be extended in the arable farming districts, and it is one of the best crops to sow on summer-fallowed land.

Main-crop potatoes should be horse-hoed and moulded up as opportunity offers. Spraying should be done during early growth, and repeat dressings given as required.

CEREAL HARVEST.

Any slack days during the early part of January can be spent profitably in overhauling reaping-machines. The platform and elevator canvases should be carefully attended to. All broken slats should be renewed, and it is usually best to replace any that are at all cracked, as these generally break later on and may hold up the machine. The sprocket-wheels and driving-chains should be carefully examined. The wheels must be exactly in line and the chains run fairly slack, as they are liable to break if too tight. All oil-holes should be carefully cleaned out, and to make sure that none is missed it is a good plan to do the entire length of one shaft before going on to the next. When operating a reaper-and-binder, it is important to use good oil and lubricate the machine thoroughly. New machines generally require extra oiling.

Cereals should be cut as nearly as possible at the correct stage of ripeness. If cut too early the grain shrivels, and if cut too late there is a risk of loss by shaking. Four main stages or degrees of ripeness can be easily recognized. In the milky stage the contents of the grain when squeezed are fluid, and if cut at this stage the grain shrivels; next comes the stage of yellow ripeness, when the contents of the grain are doughy and may be easily cut through with the finger-nail; and in the fully ripe stage the grain is hard, but the straw yellow; in the final stage—dead-ripeness—the straw is white and the nodes shrivelled.

The time occupied by the grain passing from the first to the fourth stage depends on the season. In hot, dry weather the change is very rapid, and where large areas have to be dealt with a start must be made on the early side.

Wheat should be harvested in the stage of yellow ripeness. Owing to the prevalence of strong winds in wheat-growing districts and the serious loss that is often caused through shaking in a ripe crop, the wheat must be cut at a definite stage in yellow ripeness. The earliest stage that wheat can be cut without causing loss in weight from shrivelled grain is when the straw is yellow but the knots still green, and the grain when squeezed does not produce any dough but may be easily cut through with the finger-nail.

Oats can be cut slightly greener than wheat, and if intended for chaff early cutting is desirable. Oat varieties differ in evenness of ripening and liability to shaking. Dunns and Tartars, for instance, shake badly because the grain ripens very unevenly; Garton's Abundance ripens fairly evenly, but loses grain badly if left till quite ripe. Generally speaking, the crop should be cut when there is a nice uniform yellow all over, but just before the greenish tinge has entirely gone. The grain should be well filled and fairly firm, but not quite hard.

Barley for malting is usually left till dead-ripe, as if cut before this the germination of the sample is uneven, which is a disadvantage in the production of high-class malt. At the stage of dead-ripeness the ears tend to bend over, the individual grains are hard, with pale-yellow wrinkled skin, and the straw is practically dry.

Cereals should be stooked as soon as cut, and the work of stooking is lightened considerably if the reaping-machine is fitted with an efficient carrier and the man operating the binder drops the bundles in straight rows. The stooks should be placed so that the prevailing wind may blow straight through them. The crop requires at least a fortnight in the stook before it is ready to stack or thresh. If stacked it should not be threshed until at least six weeks after stacking, so as to allow completion of the sweating process to which the grain is subjected in the stack.

WEANING OF LAMBS AND CALVES.

The time of weaning and method of subsequent feeding of lambs depend entirely on the farm-management method adopted under given climate, soil, and topographical conditions. Where sheep are entirely grass-fed, weaning should take place while there is still plenty of good grass available, and the lambs should be placed on the best pastures. In this way they get used to foraging for themselves before the grass goes off in the autumn.

The management of fat lambs is rather different from that adopted for flock sheep. Under North Island conditions it is usually possible to get 80 per cent. or over of Southdown-cross lambs fat off their mothers, and the remaining lambs will be weaned after the last draft of milk lambs has been got away. In the drier, arable farming districts rape is necessary for fattening the majority of the lambs after the grass dries up in midsummer. Lambs should be

allowed a day or two on grass paddocks to settle down after weaning, before they go on the rape. Rape is a very heating food, and the lambs on this crop should be watched carefully. Mustard is a good dietetic, and should always be sown with rape. As the mustard matures earlier than rape it should be sown about a fortnight later. A run-off from the rape on to a grass pasture is also desirable.

Early weaning is generally desirable in the case of calves. If weaned at four or five months they get used to foraging for themselves before the grass goes off badly in late summer or in autumn. The more adequate feeding of calves during the dry weather is a point which could receive more general attention from dairy-farmers. If the pastures dry up badly the calves should receive some green feed. If soft turnips are being fed out to the milking-cows the calves can be allowed access to these roots before the cows. They usually confine their attention to the leaves, and thus will minimize the tainting effect of the turnips when eaten by the cows.

—P. W. Smallfield, B.Ag., Fields Superintendent, Auckland.

THE DAIRY-HERD BULL.

The number of cows to be allotted to a bull naturally varies a great deal, depending on his age and abilities. It often happens that a young sire (upwards of twelve months) is purchased at the beginning of a season, but in many cases too great a use is made of him, with disappointing results. Although mature enough in a way, his service should be light for the first season, not exceeding twelve to fifteen cows. If a procedure of this sort is carried out, by the time the bull is two years old he should be capable of serving a herd of up to fifty cows.

Many farmers train the bull when young to "bail up" like the cows. This is a good practice, as it facilitates handling when it becomes necessary for any reason. The herd sire should have a ring inserted in his nose, be dehorned, always handled with care, and never given a chance to learn to use his strength. The remark is often heard that a bull is very quiet, but a large proportion of the accidents which occur are caused by quiet bulls being trusted too much. The animal should be so handled that he recognizes the man as his master.

At this time of year some dairy-farmers are apt to allow the bull to run indiscriminately with the herd. This practice is to be condemned if the best results are to be obtained. He is best kept in a handy paddock close to the milking-shed. The advantages of having the bull separated from the herd are numerous, and may mean the difference between a good and a bad season, because if any trouble arises it will be noticed almost immediately, and the necessary steps can be taken to remedy it; whereas if the bull is running with the herd it may go unnoticed for days.

When a cow comes in season she should be taken to the bull, and the common practice of leaving her with him until she has been given two services is quite sufficient. In this way the bull's service is not wasted, nor his strength unduly drained. A careful note of the date of service can be taken, and thus the calving dates of the various cows are always known, whereas if the bull is running with the herd

the services are often noted by guesswork, which is very unreliable and liable to disorganize the next calving programme for the herd.

Care should be taken that some shelter from the weather is provided for the bull, either by a live hedge or a suitable shed. A good supply of water and feed are essential for the welfare of the animal. Especially during the winter months he should receive a liberal supply of good hay and roots, so as to enable him to be in good order for the ensuing season. The addition of a small amount of concentrated feed, such as crushed oats, bran, or linseed, will prove beneficial. The bull should never be overfat, but kept in a good thriving condition.

—*Live-stock Division.*

THE ORCHARD.

SPRAYING OPERATIONS.

THE holiday season is approaching, and most orchardists are looking for a short interval in the task of spraying, thinning, and cultivation. It may be presumed that the work is well in hand and the orchard in real good condition in every respect, and unless one is growing stone-fruit, requiring harvesting at the time, the work has no doubt been so arranged as to provide for a brief interval from actual labour.

The season is now about half through, and this definite break may be an opportune time to review the work as far as it has gone and record results. Possibly black-spot occurred on certain varieties or on certain portions of the orchard. It may still be possible to place a finger on the weak spot in the defences and to derive a lesson from any failures. Such questions as the following may be asked: Should I have repeated a spray application when rain followed immediately? Should I have reduced my intervals between sprayings early in the season? Should I always test my bordeaux mixture to avoid injury by an acid solution? Should I have used Black Leaf 40 at the calyx stage and saved myself an attack of leaf-hopper? Was it safe to rely on sulphur pastes for control of black-spot, or should I have continued with lime-sulphur longer? The answers to these and similar questions are often available to the orchardist in his own orchard.

In deciding on a spraying programme for the remainder of the season various factors must be considered—the condition of the foliage, freedom from red mite or otherwise, prevalence of leaf-hopper, weather conditions in relation to black-spot development, and so on.

If the foliage on apples is clean and danger of black-spot is not imminent, one of the sulphur pastes may be regarded as the standard spray, used of course in combination with arsenate of lead, $1\frac{3}{4}$ lb. to 100 gallons, for control of codlin-moth and leaf-roller caterpillar. Where an economical control is required for all pests and diseases, a combination of lime-sulphur, sulphur paste, and arsenate of lead is more reliable, using $\frac{2}{3}$ gallon lime-sulphur, 8 lb. sulphur paste, and $1\frac{3}{4}$ lb. arsenate of lead, to 100 gallons.

Early apples, such as Gravenstein, should not be neglected after picking, but should receive at least one more spraying of sulphur

paste for the control of mildew. Pears will still require arsenate-of-lead sprays for the purpose of controlling codlin-moth and pear-slug. On apples and pears, spraying should be continued to within a fortnight of picking.

Stone-fruit should still receive attention, using $\frac{2}{3}$ gallon lime-sulphur and 6 lb. sulphur paste to 100 gallons. If red mite is absent a sulphur paste alone, or the dry-mix sulphur, and lime, would be preferable for brown-rot control. Cherry-leaf or pear-slug will now be prevalent, and stone-fruit trees should be protected. If it is found necessary to spray when the fruit is nearly ripe, hellebore powder, 1–20, is preferred, as no staining of the fruit results, otherwise arsenate of lead may be used.

CULTIVATION.

Land should be kept in good tilth during the coming month not only for the purpose of conserving moisture, but in preparation for the sowing of a cover-crop of lupins. It is preferable to drill in the seed to secure the benefit of the moisture, which is usually a few inches below the earth mulch. Good germination is assured even in a comparatively dry season, and the deeper-rooted seedlings will survive a drought.

THINNING.

The main thinning of pip-fruit should be completed by now. However, it is still advisable to go over the trees again where the thinning appears inadequate, as usually it does where the set has been heavy. Diseased and misshapen fruit should be removed at this stage and not allowed to develop further.

HANDLING OF THE PIP-FRUIT CROP.

The general remarks in last month's notes concerning the handling of the stone-fruit crop apply to the handling of pip-fruits. Picking, whether for local market or for export, should be by selection, taking only those fruits which have attained a size and maturity required for the particular market. The more pickings taken from a tree the better the average sample. The local markets require as much consideration as overseas markets, and should not be regarded as a dumping-ground for low-grade fruit.

Grading and packing should be done carefully. Clean new packages, well packed, clearly branded and describing accurately the contents, give buyers confidence. The picking of fruit for export should receive very special consideration, especially in regard to maturity. While overmaturity is a serious fault in fruit intended for overseas, the picking of immature fruit is just as serious, and must be avoided. There is always a temptation to make an early picking to ease trees of a load. The writer can only recommend the orchardist to exercise extreme patience, and few days' wait often makes a wonderful improvement in colour and quality, and gives the grower a reasonable pick of good fruit, instead of having to scrape to secure sufficient doubtful fruit to handle as a line. Fruit gathered under such circumstances is disappointing when brought into the packing-shed. It usually looks better in the bright light of the orchard.

BUDDING.

Stone-fruit trees, which are usually reworked by budding, will be ready for this operation during the coming month. Cherries come first, followed by plums, then peaches and nectarines. The latter may be budded up till the end of February. Three important points in connection with budding may be noted: Buds which are taken from new shoots must be from bud wood still showing growth, otherwise they will be too ripe; there must still be growth in the stock, otherwise a union cannot take place; stock wood should be of the same age as the wood the buds come from.

—N. J. Adamson, Orchard Instructor, Hastings.

Citrus-culture.

A feature of the citrus-groves this season is the remarkably heavy flowering and the rather impoverished condition of the foliage, both no doubt in large measure attributable to the dry conditions of last summer and autumn, which brought about a well-ripened-wood condition. With this abundant crop and weak foliage, trees will require more than the usual care during the summer if the fruits are to be well developed and the trees improved in tone.

Cultivation: The land should be worked to a fine tilth as early as possible, and this maintained. If it is not possible to maintain at least 4 in. of the surface soil in a finely divided state, trees should be mulched to at least the spread of the branches with rough litter or manure, and the land between the trees kept worked and free from weeds or other crops.

Manuring: The heavy flowering and strain of fruit-set and pip-development will have exhausted most of the readily available fertilizers applied in the spring. It will be advisable to apply nitrogen in the form of nitrate of soda or sulphate of ammonia periodically, following showers of rain, throughout the season. An amount of 2 lb. per medium to large fruiting trees is a good application for late December, with a further 1 lb. at any rainy period in late January or February.

Pruning: With an abundant crop of most kinds of fruit, thinning is resorted to in order to improve the quality of the fruit and lessen the strain on the tree. While it is not practicable to thin citrus fruit in such a way, the same general principle applies; but in this case the crop is best reduced by pruning away or shortening back the semi-worn-out type of wood least able to mature good fruits. While many growers have not been inclined to do this in the general spring pruning, when dead and cross wood only was removed, with a good crop now in sight it is not too late to prune back the weaker lateral fruiting twigs. At this season these will revegetate and provide foliage to the immediate benefit of the tree, also furnish young laterals for future fruiting. Young trees not yet in fruit will be making strong growths, which if perpendicular and not required in the framework should be cut back to induce side growth, or if wanted for the formation-work lightly tipped to ensure stability. Where strong growths are of a flatter or pendular type they should be spaced and lightly tipped to form side-growths along the stem, rather than the bushy tip-growth which naturally arises on unstopped growths.

—W. H. Rice, Orchard Instructor, Auckland.

POULTRY-KEEPING.

MANAGEMENT OF THE YOUNG STOCK.

Now that the season for incubating is over and the bulk of the chickens reared to an age when they have passed the chief danger-period of their development, the poultry-keeper may look forward to a somewhat easier time than recently. There is, however, plenty of work to do if the plant is to be maintained at a high standard of efficiency. For example, it must not be concluded that because the young stock have passed the brooder stage special care and management are no longer essential. Especially does this apply to the growing pullet. If it is to develop into a vigorous specimen (and it can be only profitable if it is vigorous) it must never receive a set-back from the time of leaving the shell till reaching maturity.

One cannot overemphasize the importance of classifying the young birds according to their size and age, remembering that the more evenly the birds are graded the better will they thrive. This applies to the younger members of the flock in particular. It is a common practice, but nevertheless a mistaken one, to feed both the growing and the adult stock on the same class of food. I have recently come across cases where the morning mash contained a high proportion of forcing-material, such as meat or blood meal, which was being supplied to all members of the flock, irrespective of age. Such food is specially demanded in the case of the heavy-laying bird, particularly when it is intended to cull her out at the termination of her laying season. With the growing bird, however, such a forcing diet is quite unnecessary. The food supplied at this age should contain the elements needed to build up frame and bone, rather than to develop the egg organs—in other words, to encourage prematurity, a condition that the overfeeding of meat is sure to bring about.

It is not generally known that when a pullet commences to lay she ceases to grow. Obviously if a bird commences to lay at an early age it will remain a diminutive specimen of its breed, and thereby fail to produce a good marketable egg. It is sound practice to give chickens a good supply of animal food—say, up to eight weeks old—but between this period and until the pullets are well developed and nearing a laying-point, forcing-food should be sparingly provided. Indeed, if it is observed that the pullets show signs of coming too early to maturity, all forcing-food, such as meat or its substitutes, or even milk, should be left out of the ration. Unfortunately, many poultry-keepers have been led to force their pullets owing to incorrect teaching that early maturity is an indication of egg-laying power, and that premature laying is a sign of the desirable breeding-bird. There is no greater fallacy.

Perhaps the most important fact disclosed relative to the grading of eggs for export during the past season (and on which more will be said in these notes at a later date) was the excessive number of undersized eggs which reached the depots, and which were next to useless for the overseas trade. It should be the aim of every utility poultry-keeper to correct this tendency. It will certainly never be corrected—on the contrary, it will be encouraged—if pullets are to be forced to commence laying before they are thoroughly fitted for the work.

Of course, I am not speaking of the early laying of the well-developed bird but of the pullet which commences to lay when only a little more than half the standard weight of its breed.

The importance of marking the young stock as a future guide to separating the birds according to age is not appreciated as it should be. All birds hatched this season should be promptly marked without delay. Perhaps the simplest method is to punch a hole in the web of the foot, reserving a particular section of the web of each bird for the particular season. A suitable punch for the purpose can be procured for about 2s.

RIDDING FOWLS OF LICE BY NICOTINE PREPARATION.

Having been advised that a Californian poultryman (W. R. Stewart) had discovered a new method of controlling external parasites in his poultry flock with Black Leaf 40 (a by-product of tobacco), it was recently decided to try this preparation for freeing fowls of vermin at the Wallaceville Poultry Station. The result of the experiment was most satisfactory. Not only did the material have the effect of rapidly killing all kinds of insect pests that happened to be on the birds, but the treatment in no way upset the flock. The low cost of the necessary material, and the short space of time required for its application as compared with the methods commonly employed in ridding fowls of vermin, such as dusting with insect-powder, dipping, &c., are greatly in favour of the new method. Not only this, but the catching and handling of each bird for the purpose of dusting must necessarily upset the flock, and be followed by a reduced egg-yield.

It is estimated that from 2½ lb. to 3 lb. of Black Leaf 40 will be sufficient to free 1,000 birds of any lice that may be upon them. The material for this number can be effectively applied in about fifteen minutes, and the following is a good way of doing so: Make a small hole in two opposite corners of a small tin containing the material, and pass it along each perch, leaving a thin line of the liquid on the perch. Do this at dusk, just before the birds go to roost. For the treatment to be really effective it is important that all birds shall go or be placed on the perches, and not allowed to roost in odd corners of the house. Birds that are in broody-coop, &c., may be freed from vermin by dipping a feather into the liquid and drawing it under both wings, or by putting a small amount on the breast-feathers.

There are many kinds of insect vermin which attack fowls. The object, however, of the experiment referred to was to kill those kinds which live continually on the body. Among those most commonly known to poultry-keepers is the ordinary body-louse. Its favourite location is surrounding the abdominal region. Then there is a distinct form of louse which affects the head. There is also the depluming mite, of minute size, which is usually found at the root of the feathers. Another form of louse, which is probably more responsible for birds acquiring the habit of feather-pulling than any other cause, is usually located on the quills on the inside of the wing-feathers. One may reasonably assume the feather-pulling habit would soon disappear from flocks troubled in that way if the Black Leaf 40 treatment for lice were resorted to.

As opportunity arises further experiments will be conducted in dealing with parasites, both internal and external, which are seriously affecting the profit-making power of so many poultry flocks in the Dominion.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

RETURNING SWARMS TO PARENT HIVES.

Swarms in January are of little value except as increase for the next season, and should be returned to the hives whence they originated if these can be traced. It is a good plan to kill the old queen in the swarm when returning it, at the same time destroying all but two queen-cells in the parent colony. If the hive is cramped an extra super may be given, and with this inducement the colony will usually settle down at once to work.

After-swarms should always be returned to the parent hive. They are easily disposed of even if the beekeeper does not know whence they came. If they are shaken through an excluder into an empty super the virgin queen or queens can easily be picked out as they attempt to force their way through, and once these are removed the bees will return to their old home. The young queens can then be used to replace poor queens in the apiary. It is an excellent plan to have one or two queen-cages always on hand. The young queens can each be confined in a separate cage, and when the queen to be destroyed is removed the closed cage containing the virgin can be placed on top of the frames and left there for twenty-four hours, during which time she will be fed by the bees in the hive. At the end of twenty-four hours she can be released and allowed to run down into the frames, when she will be accepted by the bees.

VENTILATION.

The matter of ventilating the hives should by now be receiving every attention. Every means should be used to ensure the bees having an abundance of fresh air day and night. All weeds and other obstructions should be removed from the fronts of the hives, and the entrances enlarged as much as possible. In extreme cases the hive-bodies should be raised from the bottom-boards by means of small blocks of wood. On no account should the bees be allowed to cluster outside the hives, and wherever they show a tendency to excessive fanning steps should be at once taken to increase the supply of fresh air to the colonies.

SUPERS.

One of the necessities of a well-regulated apiary is an abundance of supers when the honey-flow is in full swing. Every inducement should be given the bees during the often brief season to gather in every available drop of nectar. No beekeeper with business acumen will allow his bees to loaf or cluster outside the hives for lack of storage room. It is well when adding extra supers to place them between the brood-chamber and the first super, or at least to raise a few frames of honey from the first super into the second when adding the latter.

It should be understood, however, that supering must not be overdone and the bees disheartened by being given too much work at one time. On no account add a second super until the bees are well at work in the first, and in cases where the colonies are only building up well at the beginning of the honey-flow—that is, where a poor colony has been requeened and the new queen's brood has not as yet hatched—it is an excellent plan to tier up with half-stories. Many an apiarist has had a moderate return from a small colony with half-stories, when it is doubtful if any return at all would have been obtained by the use of full-depth supers.

QUEEN-EXCLUDERS.

January is the month when queen-excluders are of most use, especially in southern districts. Whatever their disadvantage may be in some localities, in the South they have proved their efficacy in enabling extracting to be finished before the hot weather goes, without the destruction of any brood whatever. Excluders should never be used for general purposes until the main honey-flow is in full swing. By that time the bees are used to working in the supers, and with nectar in abundance to be had all around them they will work cheerfully right through the hive, passing through the holes in the excluders as if no obstruction existed.

The best method of using the excluders is as follows: All sealed brood should be raised above the excluder, and the queens confined below on drawn-out combs. The brood above the excluder should be watched for a few days in case any eggs have been elevated, as the bees will sometimes attempt to raise queen-cells above the excluder. If this happens the queen-cells should be destroyed, as the queens which would emerge from them would not be able to pass through the excluders to get mated, and would in time develop into drone-layers. By providing the queen with plenty of empty combs she will be able to cultivate laying at a sufficient rate to keep up a supply of workers, and as the brood hatches out in the upper stories the cells will be at once filled up with honey.

Excluders are often condemned as being productive of overswarming, but in many localities swarming ceases automatically as soon as the main honey-flow commences, and if the queen is allowed plenty of room in the brood-chamber, and the brood in the supers carefully watched for the production of queen-cells, very little harm can come from the use of excluders, while the immense advantage of being able to extract combs entirely free of brood is worth a great deal to the apiarist at his busiest season.

FOUL-BROOD.

Foul-brood, unfortunately, is all too common in some localities, and in consequence beekeepers may at any time have a visitation. No one, however, should look upon foul-brood as a necessary evil—it can be cured. It is unknown in some parts of New Zealand, some apiarists who have been keeping bees for ten years or more never having seen it. Other districts that have in the past been troubled with the disease are now free from any sign of infection.

There is therefore no excuse for the presence of foul-brood in apiaries situated in open country; its presence is explained by carelessness on the part of the beekeeper. There is no remedy for

American foul-brood superior to the McEvoy treatment, which has been frequently described in the *Journal*, and is more fully dealt with in the Department's Bulletin No. 119, "American Foul-brood in Bees and its Treatment," which can be obtained free on application. Carelessness in dealing with foul-brood must result in heavy losses, and eventually in the destruction of the whole apiary. Make a point of treating any colonies found to be infected; though there may be only a few cells of disease showing, the infection is there, and it is not safe to trust to any methods less than the full McEvoy treatment. On no account put supers on infected colonies; this will only increase the quantity of material that must eventually be destroyed to ensure the eradication of the disease.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

THE TOBACCO CROP.

At this period the tobacco-plant reaches the blossoming stage, and the main stem completes its growth with a spike of flowers. In a good average crop the majority of the plants will reach this stage at the same time, and the operation of topping should then be carried out. When the flower-buds are allowed to remain the leaves are deprived of a certain amount of nourishment and soon deteriorate. For this reason the plants are topped by breaking off the spike of flower-buds and dropping it in the open space between the rows. In some instances, more especially for air-cured tobacco, the small bottom leaves are removed (primed) and placed out in the middle of the lane to wither. If these pieces are left in the shade under the plant or are allowed to fall on the leaves, decay will be set up and considerable damage may occur.

To carry out these operations satisfactorily the grower must carefully consider the circumstances and instruct his assistants accordingly. The length of stem to be topped off, and the number of bottom leaves (lugs) to be removed, depends on the condition of the plant and the weather at the time. If too much is taken away from a strong plant in good growing weather the remaining leaves, which form the crop, will become coarse, and strong shoots will develop in the axils (base) of the main leaves. Such coarse ribs and veins make curing difficult, and result in an inferior article when manufactured. On the other hand, if too little is taken from the plants the main leaves are deficient in size and texture, and some are immature when the plant is harvested.

In any case shoots will develop at the base of the main leaves about a fortnight after topping, and to prevent them robbing the main leaves of sap to complete their full development they must be broken out before they exceed about 3 in. in length. This operation — known as suckering — will have to be repeated probably a second time before the plants or leaves are harvested.

At this stage it is necessary to prepare for harvesting and curing the leaf. Sheds that are to be used for this purpose should be

cleared and cleansed, especially from any moulds that might infect the leaf. The exact period of ripening cannot be anticipated, as it depends very much on the weather. For this reason it is advisable to make early preparation to enable immediate advantage to be taken of suitable weather conditions as soon as the plants are ready.

TOMATOES AND CUCUMBERS UNDER GLASS.

Owing to rough weather in early November most of the outdoor tomato crops are late, and the demand for crops grown under glass should be good. The latter will now require careful feeding with liquid fertilizers fortnightly, and watering in dry situations. Ample ventilation is also required at this season, but cold winds blowing through the house must be avoided; serious damage is often done to crops by neglecting this attention at the present stage.

There is a quantity of tomatoes on the market at present in a watery condition and ripening in a very patchy manner. Such samples are in very little demand, and are likely to check consumption. The trouble may be easily avoided if more attention is given to the proper use of fertilizers. Very commonly growers are inclined to favour manures that give increased growth, and they neglect those whose effects are not quite so obvious. Of the latter potash is one of the most important, as it has a great influence on the constitution of the plant and the colour and flavour of the fruit.

Cucumber-plants under glass that are about exhausted by cropping may now be discarded, and the house thoroughly cleaned up and replanted.

BERRY-FRUITS.

Most berry-bearing plants that have had their crops gathered will now be benefited by careful summer pruning. In gooseberry-bushes strong water-shoots growing from the centre or the root should be cut out completely. In red currants superfluous strong laterals or growth from the base should be removed, and the remaining laterals shortened to induce increased cropping. The bearing-canes of raspberries should be cut out at the surface of the ground, and carefully carried out and burnt, removing also weak and unnecessary young shoots. As next season's crop of fruit depends on the crop of young canes now developing, they should be given every attention. In the strawberry beds mark sufficient plants of exceptional merit for planting out later for the special purposes of producing runners next season.

VEGETABLE CROPS.

In most districts, dwarf beans, peas, carrots, beet, turnips, lettuce, and spinach may be sown now for profitable late crops.

Carefully select seed from the early potato crop, choosing tubers from healthy plants with well-furnished roots. Spray the late potato crop in districts subject to late blight, using home-made bordeaux, 4–4–40 formula, and repeating the application at intervals of a fortnight. Two or three applications will be required.

Important crops for harvesting in autumn, winter, and spring that should be planted out now are cauliflower, savoy cabbage, leeks, celery, and broccoli. Spray the plants well in the seed-beds before

shifting them. Give the celery-plants bordeaux, and the remainder a mixture of tobacco concentrate and arsenate of lead. Soak the beds well with water the day before lifting, and when that is done select good plants of even size, place them in trays, and leave them in the shade until they are required in the field. Choose dull weather for this work, if possible; otherwise put out the plants during the afternoon.

For spring crops requiring heavily manured ground obtain what supplies of organic manures are available, and see that the material is properly stored and cured ready for ploughing in in early winter. The simplest way is to stack the supplies in a compact heap as they are obtained; they will then ferment and be less subject to leaching. Seaweed is excellent material for this purpose, and is specially suitable for sandy soils by the seaside. Soot and wood-ashes are particularly valuable, and should be kept dry under cover. Among the larger crops, such as tomatoes and cabbage, it is sometimes customary to sow a green cover-crop, so that after the harvest there is considerable green growth to plough in. Where other organic manures are scarce this is an excellent supplementary source of supply.

THE HOME GARDEN.

In most parts of this country the autumn months are most suitable for garden-making, and where work of this kind is to be done consideration should now be given to it. For recreation and shelter, for appearance and supplies of fruit and vegetables, the country home garden is of sufficient importance to demand careful forethought before the work is commenced. The work should be sufficiently advanced for sowing lawn-grass seed or laying turf in March. Herbaceous plants may be planted then. Trees and shrubs in the nurseries will not be ready for removal until May or June. Local experience, good literature, and visits to the local nursery will, if time and thought are given to the matter, supply ideas and information that will be very helpful in obtaining satisfactory results with a minimum of disappointment.

—*W. C. Hyde, Horticulturist, Wellington.*

AGRICULTURAL SHOWS, SEASON 1928-29.

THE following show-dates have been notified by agricultural and pastoral associations:—

Horowhenua A. and P. Association: Levin, 29 h and 30th January.
Feilding A. and P. Association: Feilding, 5th and 6th February.
Tauranga A. and P. Association: Tauranga, 5th and 6th February.
Dannevirke A. and P. Association: Dannevirke, 12th and 13th February.
Te Puke A. and P. Association: Te Puke, 13th February.
Masterton A. and P. Association: Solway, 19th and 20th February.
Whakatane A. and P. Association: Whakatane, 20th February.
Opotiki A. and P. Association: Opotiki, 23rd February.
Te Awamutu A., P., and H. Association: Te Awamutu, 20th February.
Taranaki Metropolitan Agricultural Society: New Plymouth, 6th and 7th March.
Morrinsville A. and P. Society: Morrinsville, 13th March.
Mayfield A. and P. Association: Mayfield, 23rd March.
Methven A. and P. Association: Methven, 27th March.
Flaxbourne A. and P. Association: Ward, 18th April.

TESTING OF PUREBRED DAIRY COWS.

NOVEMBER C.O.R. LIST.

Dairy Division.

THE period of the year has now arrived when certificates of record are being issued in comparatively large numbers. During the month of November certificates were awarded to seventy-two cows, and it will be seen from the appended list that many of the performances are of exceptional merit.

NEW AYRSHIRE CLASS-LEADER.

Despite the fact that the majority of the class-leaders for the various breeds have now reached a very high standard, class-leaderships are increased more frequently than might be expected. The latest change falls in the Ayrshire mature class, the new leader being Mr. W. Moore's Floss of Braeside, whose yield of 832·72 lb. of butterfat is a record not only for the class, but for the breed as well. The previous leader was Glencairn Brownie, owned by Mr. A. Montgomerie, of Kauwhata, with 728·05 lb. of butterfat, so that Floss of Braeside has raised the class-leadership production by no less than 104·72 lb.

Floss of Braeside was bred by Mr. W. F. Olson, of Egmont Village. In August, 1925, she commenced a C.O.R. test in the ownership of Messrs. Robertson and Blackley, New Plymouth, and on that test, starting at 5 years 275 days, gained a certificate for 678·58 lb. of butterfat. These two outstanding performances, coming so close together, mark Floss of Braeside as a cow of strong constitution as well as high productive ability. A feature of her record is the high milk-yield for an Ayrshire, her final credit being 20,305·5 lb. milk.

ANOTHER 1,000 LB. FRIESIAN.

The cow Rosevale Queen Sylvia Triumph, owned by Messrs. North and Sons, of Omimi, is well known to Friesian breeders on account of her consistently high performances under certificate-of-record test. As a junior two-year-old she gained a C.O.R. for 621·23 lb. butterfat. The following year she was withdrawn at 242 days, but gained her C.O.R. for 589·60 lb. fat prior to withdrawal. Then, again, at 5 years 104 days, she just failed to reach the 1,000 lb. level, her yield being 986·06 lb. When she was placed on test again the following year—1927–28—her performance was watched with keen interest, in anticipation of her passing the 1,000 lb. mark. As will be seen, she has yielded no less than 1,055·25 lb. of butterfat from 25,453·8 lb. of milk in 365 days, her commencing-age being 6 years 189 days. Unfortunately, she could only receive a second-class C.O.R., having failed to calve within the period for a first-class C.O.R. by the narrow margin of four days. It may be mentioned that the period allowed between calving for commencement of test and calving subsequent to test for a first-class C.O.R. is 455 days, while Rosevale Queen Sylvia Triumph was 459 days between these calvings.

Practically every name in the pedigree of Rosevale Queen Sylvia Triumph is one which high production has made familiar. Her sire is

Rosevale Plus Triumph, and her dam Rosevale Queen Daphne, who has gained certificates for 509 lb., 675 lb., and 805 lb. butterfat. Rosevale Plus Triumph is a son of Rosevale King Sylvia, who in turn is a son of Netherland King of Rosevale and Burkeyje Sylvia Posch. Netherland King of Rosevale is by Longbeach Van Tromp, and Burkeyje Sylvia Posch is by Inka Sylvia Beets Posch, so that one has here a combination of Dutch and American strains. The breeding on the dam's side is somewhat similar, as Burkeyje Sylvia Posch and Netherland King of Rosevale also appear in that half of the pedigree.

LIST OF RECORDS, NOVEMBER, 1928.

*Cow milked three times daily during whole lactation period. † Milked three times daily during part of period.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS.				
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Te Ngutu Memory ..	J. Murray, Woodville ..	2 7	241·2	365	11,852·1	647·28
Dominion Treasure Lass	Ruakura Farm of Instruction, Hamilton	1 362	240·5	365	11,302·5	614·87
Te Ngutu Irene ..	J. Murray, Woodville ..	1 361	240·5	365	11,745·8	585·96
Craigalea Isobel ..	J. G. Robertson, Eltham ..	2 55	246·0	365	10,477·1	579·01
Pelynn Mite ..	L. K. Tarrant, Ngaere ..	2 35	244·0	364	8,625·8	531·81
Oak Farm Demoiselle	G. B. Knowles, Tariki ..	1 356	240·5	365	8,177·4	501·52
Te Aute Golden Tinsel	W. Craig, Waiuku ..	1 324	240·5	365	8,903·8	501·06
Brooklyn Lady Alice	H. J. Lancaster, Glen Oroua	1 351	240·5	365	9,169·2	497·97
Te Aute Cora Bilberry	Late W. T. Williams, Pukehou	1 343	240·5	344	8,080·6	484·33
Jersey Brae Edna ..	T. Church, Te Rapa ..	1 360	240·5	365	8,690·4	479·08
Brooklyn Rose ..	H. J. Lancaster, Glen Oroua	2 17	242·2	353	9,438·3	474·88
Oak Farm Cinderella	G. B. Knowles, Tariki ..	1 335	240·5	365	7,783·0	465·87
Oak Farm Wanda ..	G. B. Knowles, Tariki ..	1 332	240·5	365	7,601·8	454·32
Jerseydale Dearest ..	John Pettigrew, Pihama ..	2 2	240·7	365	9,137·4	453·33
Hero's Flora ..	L. R. Fuller, Greenmeadows	1 349	240·5	365	8,010·3	448·78
Brooklyn Rosary ..	H. J. Lancaster, Glen Oroua	2 30	243·5	365	7,390·0	446·44
Beechlands Sweetbread	H. Robson, Koromatua ..	2 52	245·7	365	6,851·8	443·12
Edgarley Supreme ..	T. A. Millear, Tuakau ..	2 61	246·6	365	7,365·9	422·56
Jerseydale Trilby ..	J. Pettigrew, Pihama ..	1 343	240·5	365	7,275·9	418·19
Jersey Lea Minnie ..	T. Church, Te Rapa ..	1 348	240·5	271	7,022·2	407·42
Brooklyn Peggie ..	H. J. Lancaster, Glen Oroua	2 14	241·9	365	5,672·6	405·66
Green View Briar Rose	G. Taylor, Ngarua ..	1 132	240·5	365	7,144·9	402·18
Jersey Brae La Belle	R. Church, Te Rapa ..	1 361	240·5	357	7,398·0	401·45
Edgarley Magnolia ..	T. A. Millear, Tuakau ..	1 337	240·5	338	7,362·4	390·62
Brooklyn Wild Flower	H. J. Lancaster, Glen Oroua	1 324	240·5	365	7,211·5	389·56
Kia Ora Flandrine ..	R. E. Clements, Dargaville	2 4	240·9	361	6,969·4	388·94
Palmdale Golden Magnet	D. Kennedy, Morven ..	1 333	240·5	353	6,632·6	376·98
Fencourt Carnation ..	Johnson Bros., Mangapiko	2 28	243·3	365	7,603·5	375·00
Lammermoor Tui ..	M. G. McArthur, Auckland	2 25	243·0	365	8,338·0	362·95
Tauwhare Stella ..	Dr. C. G. Aickin, Auckland	2 22	242·7	353	6,107·0	338·39
Stirling Irene ..	J. A. Moffat, Turiwiri ..	1 357	240·5	365	5,965·0	322·65
Lammermoor Carnation	M. G. McArthur, Auckland	2 3	240·8	365	5,651·8	285·20
Brentwood Duchess ..	C. A. Willis, Pukekohe ..	1 354	240·5	340	4,037·5	270·97
Senior Two-year-old.						
Brooklyn Lady Meg	H. J. Lancaster, Glen Oroua	2 305	271·0	365	9,852·8	587·90
Brookley Gipsy ..	W. Johnson, Ngaere ..	2 280	268·5	349	8,410·4	434·75
Tauwhare Sybil ..	Dr. C. G. Aickin, Auckland	2 336	274·1	365	7,582·1	429·46
Brookley Jewel ..	W. Johnson, Ngaere ..	2 114	251·9	353	7,978·0	429·32

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
			JERSEYS—*continued.*			
		Yrs. dys.	lb.		lb.	lb.
Three-year-old.						
Dominion Cosmos ..	Ruakura Farm of Instruction, Hamilton	3 357	312·7	365	14,151·3	715·06
Gowanlea White Socks	J. Robb, Westmere ..	3 341	311·1	365	11,626·2	615·35
Sunhill Olga ..	F. Phillips, Otorohanga ..	3 95	286·5	354	10,198·7	574·06
Cyrilla's Queen ..	W. Johnson, Ngaere ..	3 43	281·3	365	8,347·0	468·46
Ferndale Lady Bird ..	J. J. Springgay, Gisborne ..	3 69	283·9	365	8,786·7	401·96
Willow Burn Queenie	P. S. Grant, Puerua ..	3 320	309·0	336	6·018·4	359·99
Clifton Some Chase ..	Mrs. A. Jagger, Whitford ..	3 43	281·3	336	6,350·6	350·05
Four-year-old.						
Craigalea Bonnie ..	J. G. Robertson, Eltham ..	4 346	348·1	365	12,664·3	728·58
Dominion Banksia ..	Ruakura Farm of Instruction, Hamilton	4 363	349·8	365	13,318·1	725·83
Oak Farm Gold Petal	G. B. Knowles, Tariki ..	4 360	349·5	365	10,061·3	611·91
Mature.						
Vixen's Waveney Queen	O. Aldis, Feilding ..	7 54	350·0	365	10,985·6	730·64
Vixen's Waveney Girl	O. Aldis, Feilding ..	6 345	350·0	365	10,727·4	667·10
Sultan's Ixia ..	R. Harper, Otorohanga ..	5 4	350·0	365	11,109·4	587·70
Brentwood Favourite	C. A. Willis, Pukekohe ..	5 5	350·0	358	8,029·8	535·84
Fernaig Fay ..	J. A. Moffat, Turiwiri ..	6 278	350·0	365	9,025·2	485·85
Hesba	R. Harper, Otorohanga ..	5 358	350·0	365	8,124·0	485·45
Lakeside Mabel ..	James Paul, Toa Toa ..	7 30	350·0	268	10,320·4	466·33
Jersey Meadows Iris ..	H. H. Phillips, Te Rehunga	9 47	350·0	263	7,693·6	406·76
			FRIESIANS.			
Junior Two-year-old.						
Dominion Magnolia ..	Central Development Farm, Weraroa	2 24	242·9	363	10,910·3	400·67
Dominion Queen Chloe	Central Development Farm, Weraroa	2 42	244·7	365	11,206·9	358·68
Dominion Manoa ..	Central Development Farm, Weraroa	2 38	244·3	361	8,282·1	268·50
Senior Two-year-old.						
Rosevale Sylvia Plus Keyes*	North and Sons, Omimi ..	2 224	262·5	365	17,866·1	619·98
Dominion Olga May Echo	Central Development Farm, Weraroa	2 330	273·5	365	13,680·4	498·70
Dominion Sylvia Mercedes	Central Development Farm, Weraroa	2 335	274·0	326	12,938·0	447·59
Dominion Carnation of Weraroa	Central Development Farm, Weraroa	2 324	272·9	365	12,787·4	443·97
Senior Three-year-old.						
Rosevale de Kol Plus*	North and Sons, Omimi ..	3 227	299·7	365	20,216·7	610·40
			MILKING SHORTHORNS.			
Senior Three-year-old.						
Dominion Promise of Ruakura	Ruakura Farm of Instruction, Hamilton	3 345	311·5	338	11,306·1	473·06
Dominion Vida of Ruakura	Ruakura Farm of Instruction, Hamilton	3 316	308·6	330	9,249·0	410·46
Dominion Hillcrest of Ruakura	Ruakura Farm of Instruction, Hamilton	3 360	313·0	326	8,458·7	349·70

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		MILKING SHORTHORNS—*continued.*				
Senior Four-year-old.		Yrs. dys.	lb.		lb.	lb.
Dominion Dellfree of Ruakura	Ruakura Farm of Instruction, Hamilton	4 329	346·4	350	9,935·2	409·66
Mature.						
Dominion Conceit of Ruakura	Ruakura Farm of Instruction, Hamilton	8 336	350·0	365	16,255·1	727·35
Matangi Mary 5th ..	Ranstead Bros., Matangi ..	5 314	350·0	365	15,945·5	556·40
	AYRSHIRES.					
Mature.						
Floss of Braeside ..	W. Moore, Homebush ..	7 287	350·0	365	20,305·5	832·72
	RED POLLS.					
Two-year-old.						
Dominion Constantia	Central Development Farm, Weraroa	2 29	243·4	365	5·742·2	251·35
	Second-class Certificates.					
	Friesians.					
Mature.						
Rosevale Queen Sylvia Triumph*	North and Sons, Omimi ..	6 189	350·0	365	25,453·8	1,055·25

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 20th September to 29th November, 1928, include the following of agricultural interest:—

No. 57991: Teat-cup inflation; A. Cranswick, Tolaga Bay. No. 59266: Driving cheese-curd agitator; J. B. MacEwan and Co., Ltd., Wellington. No. 60559: Shearing-machine comb-plate; W. G. Maw, Sydney, N.S.W. No. 59115: Method of dressing flax; F. T. F. Evans, Auckland. No. 59162: Harrow; H. R. Clover, Waitakaruru. No. 59181: Regenerating or cleansing cream; A. D. Cave, Wanganui. No. 59232: Potato-planter; P. and D. Duncan, Ltd., Christchurch. No. 59361: Cooling milk; W. H. Harris Tinsmiths, Ltd., Christchurch. No. 59649: Cream-separator; A. J. Squire, Kaikohe. No. 60150: Automotive plough; Squire Autoplough Tractor Co., Ltd., Sydney, N.S.W. No. 60408: Manure-distributor; A. Macpherson, Kohi. No. 60678: Drying casein; N.Z. Co-operative Dairy Co., Ltd., Hamilton. No. 61044: Container for butter; J. Fielding and Co., Ltd., Sydney, N.S.W. No. 58725: Butter-box-making machine; Ellis and Burnand, Ltd., Hamilton. No. 58987: Milking-machine installation; J. S. Read, Christchurch. No. 60946: Teat-cup inflation; L. E. Fink, Onehunga. No. 59011: Manure and seed distributor; T. H. Groves, Eketahuna. No. 60523: Treatment of flax; W. O. Beere, Wellington. No. 60580: Egg-carton; L. Benoit, Chicago, U.S.A. No. 59088: Manure-distributor; W. H. Franks, Riverlea. No. 59477: Manure-distributor; W. P. Simpson, Mauku. No. 59705: Chaff-cutting and grain-separating machine; H. G. Groube, South Morang, Vic. No. 60370: Teat-cup support; O. Meuli, Patea. No. 59036: Weed-destroying preparation; Weed Control Co., of California, Berkeley, U.S.A. No. 59912: Hay-sweep, L. Butler, Inglewood.

Copy of full specifications and drawings in respect of any of the above may be obtained from the Registrar of Patents, Wellington, price 1s. prepaid.

LIVE-STOCK IN NEW ZEALAND, 1928.

Unless otherwise specified, the enumeration is at 31st January.

Land District.	Horses.	Asses and Mules.	Cattle (including Dairy Cows).	Dairy Cows.		Number of Sheep shorn, 1927–28.	Number of Lambs tailed, 1927–28.	Sheep (including Lambs) as at 30th April, 1928.	Pigs.	Goats.	
				In Milk.	Dry.					Angora.	Other.
North Auckland ..	32,617	65	465,058	202,392	18,923	850,202	405,978	902,093	90,650	655	2,231
Auckland	45,766	11	733,868	350,770	23,743	1,110,431	609,576	1,100,847	180,700	828	2,703
Gisborne	19,122	55	295,401	29,935	5,065	2,878,301	1,363,564	3,102,129	17,138	142	2,732
Hawke's Bay	15,517	3	202,779	45,512	5,904	2,709,742	1,503,987	3,077,763	17,817	2,092	2,345
Taranaki	19,815	1	356,802	196,955	10,224	793,928	403,127	814,054	64,988	23	4,377
Wellington	40,766	41	626,204	180,046	18,145	5,123,528	2,827,825	5,576,902	78,122	636	449
Nelson	6,985	3	63,486	25,337	3,479	362,071	149,442	411,178	16,792	522	856
Marlborough	6,855	9	41,046	14,320	2,031	1,005,624	430,621	1,062,147	8,149	915	2,313
Westland	2,347	..	40,206	10,929	1,531	61,088	43,510	68,805	6,734	10	180
Canterbury	58,073	46	165,745	69,991	7,968	4,238,650	2,721,197	5,266,827	58,732	64	96
Otago	33,621	8	125,423	49,299	6,599	3,102,183	1,601,861	3,684,494	27,041	4	63
Southland	25,676	8	157,751	67,243	6,057	1,722,829	1,118,284	2,066,571	20,035	5	10
Dominion totals ..	307,160	250	3,273,769	1,242,729	109,669	23,958,577	13,178,972	27,133,810	586,898	5,896	18,355
Totals 1927 (or 1926–27)	303,713	222	3,257,729	1,181,545	121,680	23,441,808	12,069,681	25,649,016	520,143	5,816	20,283

—*Census and Statistics Office.*

WEATHER RECORDS: NOVEMBER, 1928.

Dominion Meteorological Office.

GENERAL NOTES.

NOVEMBER was a dry month in most parts of the Dominion. Rainfall was above the average in the eastern districts of the North Island from Wellington to East Cape, and at scattered places in eastern parts of the South Island, but elsewhere there was a considerable deficit.

The month was on the whole cool, though summerlike conditions set in suddenly on the 16th and continued till the 25th. During this period remarkably fine weather was the rule. This year has been characterized by an unusual frequency of thunderstorms, and this feature was maintained during November, there being only twelve days on which thunderstorms were not reported by some station. Frosts were few in number and light only.

On the 1st the weather was controlled by the cyclone which had crossed the northern part of the North Island, and which was referred to in the notes for October. General rain fell over the North Island with many heavy falls. The floods in the Wairarapa and Manawatu Rivers were maintained.

On the 5th an intense depression of the westerly type brought heavy rain to the western districts and central highlands of the South Island. Northerly gales were experienced from Cook Strait southwards.

Conditions remained rather unsettled until the 12th. Between the 8th and 12th another rather intense depression passed, culminating in the development of a cyclone off East Cape. On the 8th and 9th northerly gales blew, that on the 8th being very heavy and doing much damage in Christchurch. From the 10th to the 12th there were south-westerly gales with heavy rains in most districts and low temperatures. Snow fell on the high country and hail in places. Strong southerly winds and cold showery weather continued between Napier and East Cape till the 15th, the rain being particularly heavy at East Cape.

The fine and warm spell to which reference has already been made followed the unsettled period of the first half of the month. On the 25th, however, a fairly intense cyclone approached from the Tasman Sea, and crossed the Dominion during the following two days. The passage was accompanied by good general rains, especially on the 26th, which were of great benefit to the country. Cool south-westerlies set in on the 27th as the cyclone passed, but the storm was losing intensity and the cold snap proved of only slight severity.

The remainder of the month was mainly fine with moderate temperatures.

—*Edward Kidson, Director of Meteorological Services.*

RAINFALL FOR NOVEMBER, 1928, AT REPRESENTATIVE STATIONS.

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average November Rainfall.
	North Island.				
		Inches.		Inches.	Inches.
1	Kaitaia	2·90	11	0·74	3·27
2	Russell	1·44	9	0·69	2·52
3	Whangarei	2·50	13	0·68	3·04
4	Auckland	1·89	11	0·82	3·26
5	Hamilton	3·07	12	0·99	4·04
6	Kawhia	2·17	11	0·58	4·69
7	New Plymouth	2·63	12	0·85	4·65
8	Riversdale, Inglewood ..	6·48	13	1·98	8·95
9	Whangamomona	5·54	7	2·56	7·29
10	Eltham	4·47	11	2·06	3·35
11	Tairua	1·20	9	0·28	3·96
12	Tauranga	1·10	6	0·38	3·29
13	Maraehako Station, Opotiki	2·30	5	1·68	3·04
14	Gisborne	3·80	12	0·81	3·02
15	Taupo	5·24	10	2·01	3·43

RAINFALL FOR NOVEMBER—*continued.*

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average November Rainfall.
	North Island—continued.				
		Inches.		Inches.	Inches.
16	Napier	2·88	13	1·10	2·51
17	Maraekakaho Stn., Hastings	3·62	16	1·60	2·03
18	Taihape	2·50	13	0·60	3·69
19	Masterton	4·42	14	1·13	2·73
20	Patea	3·05	10	0·76	3·91
21	Wanganui	3·69	10	1·73	3·18
22	Foxton	3·02	7	1·00	3·24
23	Wellington (Karori Reservoir)	6·01	11	2·64	3·04
	South Island.				
24	Westport	4·97	17	1·39	7·08
25	Greymouth	6·68	17	1·20	9·13
26	Hokitika	6·68	18	1·68	10·73
27	Ross	6·64	12	0·99	13·94
28	Arthur's Pass	8·88	11	1·85	15·50
29	Okuru, Westland	12·26	12	1·40	12·96
30	Collingwood	5·73	10	2·04	7·68
31	Nelson	1·50	6	0·72	2·93
32	Spring Creek, Blenheim ..	1·77	6	0·70	2·42
33	Tophouse	4·55	10	1·82	6·62
34	Hanmer Springs	3·01	10	1·01	2·93
35	Highfield, Waiau	2·18	6	0·78	2·51
36	Gore Bay	2·21	6	0·66	2·05
37	Christchurch	1·40	7	0·62	1·87
38	Timaru	1·36	10	0·66	1·96
39	Lambrook Station, Timaru	2·28	6	0·84	2·01
40	Benmore Station, Clearburn	2·16	9	0·58	2·01
41	Oamaru	0·58	8	0·16	1·93
42	Queenstown	3·40	13	0·99	2·74
43	Clyde	0·93	8	0·29	1·36
44	Dunedin	1·99	13	0·70	3·27
45	Wendon	1·75	8	0·36	2·74
46	Gore	2·29	13	0·64	3·23
47	Invercargill	2·72	15	0·60	4·40
48	Puysegur Point	5·58	15	1·12	8·36
49	Half-moon Bay (Stewart Is.)	5·13	14	0·73	6·15

FERTILIZER IMPORTATIONS: SEPTEMBER QUARTER.

FOLLOWING are the importations of fertilizers into New Zealand for the three months ended 30th September, 1928:—

Sulphate of ammonia: United Kingdom, 112 tons; Australia, 542 tons; Germany, 25 tons; United States of America, 115 tons. *Basic slag:* United Kingdom, 1,684 tons; Belgium, 6,206 tons; Germany, 1,491 tons. *Guano:* United Kingdom, 10 tons; Seychelle Islands, 9,387 tons; Walpole Island, 2,896 tons; Juan de Nova, 3,354 tons; New Caledonia, 2,082 tons. *Rock phosphate:* Ocean Island, 6,140 tons; Nauru Island, 23,090 tons; Makatea Island, 3,569 tons. *Phosphates (other):* Belgium, 950 tons; Egypt, 1,750 tons; Morocco, 3,125 tons. *Superphosphate:* Belgium, 27 tons; Holland, 700 tons. *Kainit:* France, 57 tons; Germany, 192 tons. *Muriate of potash:* France, 15 tons. *Sulphate of potash:* France, 215 tons; Germany, 271 tons. *Potash (other):* France, 1,036 tons; Germany, 1,379 tons. *Sulphate of iron:* Australia, 15 tons. *Nitrate of soda:* Belgium, 30 tons; Chile, 325 tons. *Bonedust:* India, 425 tons. *Other manures:* United Kingdom, 12 tons; France, 1 ton; Germany, 69 tons.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

TREATMENT OF DEFICIENCY DISEASES IN SHEEP.

"SHEEP-FARMER," Gisborne :—

I should be obliged to have answers to the following queries : (1) In connection with the treatment of sheep in sheep-sick country (Bay of Plenty hill country), is the provision of a salt lick containing sulphate of iron of any value ; and, if so, in what proportions should the mixture be made ? Can you give me any information about citrate of iron in the same connection. At what cost can a good result be obtained ? (2) In regard to lack of fertility or fecundity in ewes in Poverty Bay, is the provision of iodine effective in improving matters ; and, if so, how can the iodine be best applied ?

The Live-stock Division :—

(1) Sulphate of iron and salt as a lick has not been found to have any value in the treatment of bush sickness. Citrate of iron and ammonia is effective as a curative agent in this disease, but it must be given as a drench. When given as a lick it is found that some animals will not take it. Further, it is found that a lick made of these ingredients will not carry the citrate of iron in equal proportions, the tendency being for the iron to fall to the bottom. In bush-sick country we have found that the treatment when supplied through a lick was nothing like as effective as when the animals were drenched. This is to be regretted, as the saving of labour would be considerable. (A new method of treating sheep by means of medicated pellets placed in troughs, now under test, is referred to in the article, "Farming of Bush-sick Country," on page 410 of this issue.—ED.) Citrate of iron and ammonia is obtainable from the Inspectors of Stock, Tauranga or Rotorua, at a cost of 2s. 6d. per pound. One pound of the iron crystals is dissolved in 13½ pints of water. Three to four teaspoonfuls of the solution is a dose for a sheep. (2) With reference to the lack of fertility or fecundity, iodine has proved useful in this direction. It is used in the form of iodine of potassium, 4 oz. of which should be dissolved in water and sprinkled over 100 lb. of dried salt. After the salt is again dried it should be placed in boxes for the sheep to lick.

GROWING BULB BLOOMS FOR MARKET.

A. E. M., Motueka :—

I have a number of narcissi, jonquils, and poetaz, and should be much obliged if you would tell me how to deal with them to get the best flowers. The soil is a sandy loam and rather deficient in humus and plant-food generally. Should they be dug up every year and dried off to give them a rest ? If so, when should they be planted to come in flower at the best time for the Wellington market ? Any other information would be much appreciated.

The Horticulture Division :—

For cut blooms for the market narcissus bulbs are generally planted in beds seven rows wide, with an interval between the beds sufficiently wide for a foot-track. Make the rows 15 in. apart, and on light soil plant the bulbs 5 in. to 6 in. deep and 3 in. to 4 in. apart. The beds may be left undisturbed from three to four years. For early blooms early planting must be practised. The bulbs should be planted as soon as possible—that will be in December or January. The land you describe would be much improved if it were well stocked with humus. For fertilizer treatment apply 4 oz. bonemeal and ½ oz. sulphate of potash per square yard before planting.

MOUTHING OF YOUNG HORSE.

G.L.W., Titahi Bay :—

Please advise me how long a young horse should have the mouthing-gear on. Is it advisable to leave it on all night ?

The Live-stock Division :—

A young horse requires to be well mouthed before being first put to work. It is the usual custom to put on the mouthing-gear after the morning feed, leave it on till the midday meal, and replace it again until the evening meal. It is not advisable to leave the gear on all night. A week to ten days of such practice is generally recognized as sufficient time for the average horse, but a great deal depends on its breed, and the class of work to be done. Opinions differ in regard to the length of time, but the mouthing is an essential part of the young horse's early training.

CROP AREAS AND YIELDS, SEASONS 1926-27 AND 1927-28.

Crop.	1926-27.		1927-28.	
	Area.	Average Yield per Acre.	Area.	Average Yield per Acre.
Wheat—	Acres.		Acres.	
Grain ..	220,083	36·13 bushels	260,987	36·56 bushels.
Chaff, &c.	928	1·87 tons	1,191	2·00 tons.
Oats—				
Grain	117,326	42·58 bushels	88,223	43·66 bushels.
Chaff, &c. ..	255,372	1·70 tons	201,437	1·71 tons.
Barley—				
Grain	29,886	41·60 bushels	21,091	40·87 bushels.
Chaff, &c. ..	528	1·66 tons	661	1·83 tons.
Maize—				
Grain	10,249	47·94 bushels	10,291	46·93 bushels.
Ensilage	730	3·31 tons	549	3·23 tons.
Peas and beans ..	15,495	29·35 bushels	25,128	31·93 bushels.
Linseed—Seed ..	4,933	7·80 cwt.	5,213	6·00 cwt.
Rye-grass—Seed ..	42,082	424·45 lb.	23,545	444·60 lb.
Cocksfoot—Seed ..	9,820	189·21 lb.	11,493	173·36 lb.
Chewings fescue—Seed	9,634	225·98 lb.	10,021	267·90 lb.
Crested dogstail—Seed	9,307	159·26 lb.	8,948	236·19 lb.
Red clover and cow-grass—Seed	8,540	181·87 lb.	7,887	180·00 lb.
White clover—Seed ..	4,029	165·07 lb.	2,294	165·55 lb.
Other grasses and clovers —Seed	4,287	87·57 lb.	1,493	120·04 lb.
Grass and clover hay ..	260,674	1·85 tons.	250,984	1·76 tons.
Lucerne hay ..	27,781	2·40 tons.	29,257	2·44 tons.
Potatoes	24,616	4·73 tons.	21,693	5·59 tons.
Green fodder crops ..	219,031	..	216,702	..
Turnips	462,360	..	459,704	..
Mangolds	11,870	..	10,329	..
Onions	765	9·28 tons	703	8·70 tons.
Hops	636	1,408·14 lb.	609	1,246·68 lb.
Tobacco	224	..	690	..

—*Census and Statistics Office.*

ESTIMATES OF THE SEASON'S LAMBING.

FOLLOWING are estimates of the current season's lambing in New Zealand computed from estimated average percentages furnished by Inspectors of Stock. Corresponding figures for the four previous years, together with the actual number of lambs tailed therein, are also given for comparison.

Year.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
		NORTH ISLAND.		
1928 ..	8,211,878	84·61	6,948,380	..
1927 ..	7,905,432	87·28	6,899,861	7,114,057
1926 ..	7,503,200	84·35	6,329,338	6,459,775
1925 ..	7,463,735	85·64	6,391,812	6,345,218
1924 ..	7,148,949	85·00	6,049,654	6,199,881
		SOUTH ISLAND.		
1928 ..	7,322,173	87·74	6,424,887	..
1927 ..	6,926,298	86·17	5,968,979	6,064,915
1926 ..	6,445,052	84·79	5,465,361	5,609,906
1925 ..	6,251,488	78·61	4,914,046	5,090,562
1924 ..	5,927,145	87·87	5,208,378	5,267,266
		DOMINION.		
1928 ..	15,534,051	86·09	13,373,267	..
1927 ..	14,831,730	86·76	12,868,840	13,178,972
1926 ..	13,948,252	84·57	11,794,699	12,069,681
1925 ..	13,715,223	82·43	11,305,858	11,435,780
1924 ..	13,076,094	86·14	11,258,032	11,467,147

The following table gives estimates of the current (1928) season's lambing for the several sheep districts :—

Sheep District.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.
Auckland	1,339,246	86·41	1,157,311
Napier-Gisborne	3,680,579	79·80	2,937,276
Wellington-West Coast ..	3,192,053	89·40	2,853,793
Marlborough-Nelson-Westland	727,800	78·25	569,352
Canterbury-Kaikoura ..	3,337,802	91·53	3,055,163
Otago (including Southland)	3,256,571	85·99	2,800,372
Dominion	15,534,051	86·09	13,373,267

—*Live-stock Division.*

Reputed Fertilizers and Phosphate Rocks.—None of such specimens forwarded for examination to the Department's Chemical Laboratory during the year 1927–28 was found to have any commercial value. Eleven samples of reputed guanos collected at White Island by Mr. Grange, of the Geological Survey, were analysed for fertilizer constituents, with results which showed no sample to contain more than 3·44 per cent. phosphoric acid, or 0·49 per cent. nitrogen, while in most of the samples the amounts were much lower.

Correction.—In the specification of export half-case for pears, page 356 of last month's *Journal*, the number of cleats should be *four*, not eight.